

Diet and Stress



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KEYWORDS

• Diet • Stress • Nutrition • Supplementation • Vitamins • Minerals

KEY POINTS

- Nutrition, diet and stress.
- Stress and nutritional insufficiency.
- Nutrition for stress.

“Let food be your medicine and let medicine be your food.”

—Hippocrates

INTRODUCTION

Stress in biological terms refers to the reaction of the body to the disturbance of the equilibrium given particular stimuli. A stressor can vary in intensity, and people have different levels of coping ability to respond well or fail to respond properly to an event that has occurred in their life, whether physical or emotional. Physiologic systems work in a complex and integrated manner. There are many factors of one's daily lifestyle that bring stress upon the body. Stress is a common problem in most modern societies, in which there are economic pressures; political, religious, and other social conflicts; overpopulation; contamination; and a food industry that provides main staple foods that are additional stressors (refined carbohydrates, excessive animal fats, artificial colors, preservatives, and sweeteners). Unhealthy eating patterns will only result in an increased level in stress, followed by further health problems in the near future if the issues are not resolved. With a healthy eating plan accompanied with scientific supplementation and a proper stress management program, one can overcome stress, prolong one's life span, and reduce the likelihood of stress-related illnesses.

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Abbreviations	
ANS	Autonomic nervous system
DHA	Docosahexaenoic acid
EPA	Eicosapentaenoic acid
PMS	Premenstrual syndrome

The US population in general as a whole is overstressed. It is well understood that stress and perceived stress in adults contribute to a wide range of disorders including hypertension and elevated plasma cortisol,¹ cardiac and cardiovascular disease,² inflammatory bowel syndrome,³ type 2 diabetes mellitus,⁴ and a reduced quality of life among those suffering with cancer.⁵⁻⁷

Stress happens in 3 stages. The first is an initial state of alarm (fight or flight response), which produces an increase of adrenaline. Living organisms can withstand occasional extreme stress and still survive. The second stage is a short-term resistance mechanism that the body sets up to cope with the problem. The final stage is a state of exhaustion. The exhaustion stage occurs when the body has used up all its available resources. If the situation is not taken care of, stress can produce long-term damage to the body, including heart problems, high blood pressure, the immune system problems (susceptibility to infections and allergies), skin problems (acne, itchy rashes, psoriasis, and eczema), pain (neck, shoulder and back), diabetes, and infertility.⁸

Stress affects the whole body in the following sections provide a brief description of how stress affects different body systems.

Musculoskeletal System

When muscles are tense for prolonged periods of time, other reactions of the body promote stress-related disorders. Tension headache and migraine headache have been associated with chronic muscle tension in the area of the shoulders, neck, and head.

Respiratory System

Stress can make breathing more difficult. For those with asthma or a chronic obstructive disease, getting enough oxygen can become difficult.

Cardiovascular

Repeated acute stress and persistent chronic stress can induce inflammation in the vasculature, especially of the coronary arteries. This is one of the proposed mechanisms associating stress to myocardial infarcts. In addition, it has been shown that the way a person responds to stress can alter cholesterol levels.

Endocrine

Stress affects how the hypothalamus signals the pituitary gland and the autonomic nervous system to secrete the stress hormones epinephrine and cortisol. The hypothalamus stimulates the adrenal glands cortex to produce cortisol and the adrenal medulla to produce epinephrine. This gives the body the energy to run from danger.

The Nervous System

Chronic stress can result in a long-term drain on the body. As the sympathetic nervous system continues to trigger physical reactions, it causes a wear and tear on the body.

Excessive activation depletes the system of neurotransmitters, peptides, cofactors, and other mediators and also alters receptor response.⁹

NUTRITION, DIET AND STRESS: THE LINK BETWEEN STRESS AND NUTRITIONAL INSUFFICIENCY

Stress creates greater physiologic demands. More energy, oxygen, circulation, and therefore more metabolic cofactors are needed (eg, vitamins and minerals). The irony of stress is that people suffering stress need a more nutritionally dense diet but often opt for comfort foods lacking in the necessary nutrients, consequently inducing a situation of nutrient depletion that further compromises the metabolic systems. This situation can be further complicated by the use of medications that often contribute to nutrient depletion.

Stress can cause unhealthy eating habits. People who often endure stress have no time to fit a balanced nutrition around their busy schedule. Moreover, stress makes the body crave foods that are high in fats and sugars. This eating problem in time will inflict a greater stress on the body, plus a nutritional insufficiency state that poses a threat to one's physical and mental health. Stress can have the effect of making people skip or forget to eat their meals. Also people under stress use coffee or other stimulants to assist them and help them cope. The problem with coffee is that it contains caffeine, which, if taken in large quantities, can have negative adverse effects on the body. One problem is that the person is using coffee to stay awake when rest is obviously needed. Caffeine also has an impact on the hormones in the body. Adrenaline and cortisol are increased under the influence of caffeine. The neurotransmitter dopamine is also increased, all with possible negative adverse effects. The increased amount of cortisol produced by stress gives the person a strong urge to eat foods that are high in carbohydrates, sugars, and fats. This eating pattern will result in excess fat being stored. When someone is stressed and does not eat the right amount of food or the correct amount of nutrients, he or she will start to encounter inconsistencies in their blood sugar and other metabolic reactions. These inconsistencies lead to problems such as tiredness, lapses of concentration, and mood swings. If stress is not dealt with properly, the body will suffer in the long run problems that are much more serious, such as diabetes.

DIET AND STRESS

The High-Fat Diet and the Stress Response

Kitraki and colleagues¹⁰ published a study in 2004 using Wistar rats, investigating the effects of a diet high in polyunsaturated fat (corn oil) corresponding with a decreased consumption of carbohydrates and reduced intake of protein over 7 days on both energy consumption and a subsequent stress reaction to a short stressor (swimming). Comparing levels of stress hormones in the high-fat/low-protein/low-carbohydrate diet rats and normally fed rats, they found that the levels of corticosterone in both sets of rats were not different during the application of the stressor. Additionally, corticosterone concentrations appeared to not be affected by the different diets. However, further analysis of the blood showed elevated levels of glucocorticoid receptors within the hypothalamic area of the rats fed a normal diet, while lower glucocorticoid receptors levels were found in the rats fed the high-fat/low protein/low-carbohydrate diet. The results highlight how quickly an improper diet with high fat intake and lacking in other nutrients can adversely impact the balance of stress hormones as evidenced by lower glucocorticoid receptors in the hypothalamus known to mediate the effects of cortisol.¹¹

Omega-3 and Perceived Stress

Bradbury, Myers, and Oliver (2004) did a study to determine if perceived levels of stress can be lowered through consumption of the omega-3 fatty acid docosahexaenoic acid (DHA).¹² Participants scoring high on a scale of perceived stress were randomly assigned to either a group taking fish oil supplements containing DHA or a group (placebo group) taking supplements of olive oil for 6-weeks. For the analysis, both the fish oil group and the olive oil placebo group were compared with each other as well as against a larger control population. Following the 6-week trial, results showed that perceived stress levels were significantly lower among both the fish oil and olive oil groups. When comparing perceived stress levels between the fish oil group and the larger population, the fish oil group had significantly lower perceived stress. Further analysis showed that there were no significant differences in perceived stress levels between the fish oil and olive oil groups, and no significant difference in perceived stress levels between the olive oil and the control groups. At the end, only the fish oil group showed significant reductions in perceived stress compared with the control sample, consistent with the conclusion that omega-3 attenuates perceived stress.

Diet, Stress, and Inflammation

Inflammation is a biomarker of stress. Hänsel, Hong, Cámara, and von Känel¹³ demonstrated that situations such as work-related stress, stress associated with living in poor socioeconomic conditions, stressful events suffered in childhood, and stress associated with caring for another all contribute to chronic stress and influence the function of the immune system. Furthermore, Hänsel and colleagues¹³ described how chronic stress impacts the HPA axis and the autonomic nervous system (ANS), resulting in increased levels of inflammation. Galland¹⁴ did research exploring the impact of nutrition and patterns of food consumption on immunologic indicators of inflammation (eg, interleukin-6, tumor necrosis factor alpha, and C-reactive protein). Galland¹⁴ showed healthier, anti-inflammatory influences with food consumption patterns that result in a greater monounsaturated fat to saturated fat ratio, a greater omega-3 to omega-6 ratio, and greater levels of vegetable, fruit, whole grain, and legume consumption.

Bakker and colleagues¹⁵ did research to see if dietary changes could reduce moderate levels of chronic inflammation in individuals identified as being overweight. They provided men who were overweight with a mix of nutrients known to deliver anti-inflammatory effects (vitamin C, omega-3, and extracts derived from green tea and tomatoes) for 5 weeks. Measures were taken of blood plasma, fat tissue, and metabolic enzymes. At the end of the 5 weeks, there were no changes in measures of inflammation (C-reactive protein). Yet, there were small changes indicating some attenuation of inflammation in fatty tissues as indicated by improved performance of endothelial tissue and oxidation of fatty acids in the liver. The outcome indicates that adopting a diet high in anti-inflammatory and antioxidant properties may have beneficial impacts on inflammation and oxidative stress. It is possible that the nutrients provided were not given in enough quantities to have a more profound effect on inflammatory parameters.

Vitamins and Stress

As mentioned earlier, supplementation with vitamins may reduce stress and improve overall mood. The benefit of vitamin supplementation in reducing stress and improving mood and mental performance was shown by Kennedy and colleagues¹⁶ in a sample

of working men between the ages of 30 and 55. These men were required to fill out questionnaires measuring their mood state and perceived stress, and assessing their overall health. Cognitive functioning, mood change, and fatigue were also assessed during a battery of cognitive tests. The men were then randomly assigned to an experimental or control group. For 30 days, the men in the experimental group received dietary supplements of vitamins and minerals. During the last day of the trial, all men were asked to walk on a treadmill as they were engaged in a test of cognitive function. Analysis showed that the men who received supplements of vitamins and minerals exhibited improved cognitive performance, lower rated stress, and improved mental functioning.

Another study conducted by Mishra and colleagues¹⁷ further demonstrates how insufficient amounts of vitamins, specifically B vitamins, can contribute to distressed mood. They assessed the impact of vitamin levels (vitamins B6, B12, niacin, and folate) taken as a child and taken as an adult on women's psychological state during adulthood. Using a standardized questionnaire to assess levels of psychological distress and a memory recall session to assess patterns of food consumption and vitamin intake during childhood, they collected food intake information from a sample of women. They found that only deficient levels of vitamin B12 taken at their current adult age had an association with higher reporting of psychological distress. With respect to diet, improper nutritional balance, insufficient vitamin intake, and excess consumption of fat have been shown to exacerbate the stress response and create unhealthy balances of stress hormones. The dietary patterns shown to create positive protective effects against stress and inflammation are consistent with the Mediterranean diet, consisting of increased levels of vegetables, fruit, whole grain, nuts, seeds, beans, eggs, and higher levels of fiber along with lower levels of red meats. Stress reduction is also aided by supplementation with vitamins and minerals including magnesium, calcium, manganese, B vitamins, and vitamins C and E. Additional stress protection was shown with the intake of omega-3 fatty acids, particularly DHA from fish oil, and increasing the ratio of monounsaturated fats (omega-9) to saturated fats.

NUTRITION FOR STRESS

"Don't be foolish enough to dig your own grave with a fork and spoon."

—Anonymous

It cannot be overstated that emotional stress affects all aspects of nutrition. A wide variety of foods needs to be consumed in order to remain healthy. This is because there is not 1 food available that contains all the necessary nutrients that are required for optimal health. Therefore a selection of healthy foods is needed. Nutrients needed include minerals, vitamins, proteins, and fatty acids. Consuming the required nutrients (typically between 40 and 60 nutrients) per day is essential to a healthy, well-protected body. Sadly, most physicians have no background in nutrition. Sugar is one of the foods we should eliminate. Sugar itself contains no required vital nutrients. Sugar may produce a burst of energy for a short period of time only. When this high runs out, the person will suffer a crash.

One of the main problems with on-going stress is the depletion of nutrients. The stress response is fight or flight; either action requires lots of energy. Stress utilizes many nutrients for energy production, even if one sits in front of a computer screen all day.

B vitamins are essential for coping with stress, as they are used in most metabolic enzymes. Substances like sugar, alcohol, and caffeine will drain these resources and

affect the functionality of the body and the brain. When under stress, the body uses reserve B vitamins.

Foods can help relieve stress in several ways. Comfort foods, like a bowl of warm oatmeal can boost levels of serotonin, a calming brain chemical. Other foods can cut levels of cortisol and adrenaline, stress hormones that take a toll on the body over time. And a healthy diet can counter the impact of stress, by revving up the immune system and lowering blood pressure. One of the best ways to reduce high blood pressure is to get enough potassium, and half an avocado has more potassium than a medium-sized banana. Guacamole, made from avocado, just might be a healthy alternative when stress has one craving a high-fat food.

Carbohydrates prompt the brain to make more serotonin. For a steady supply of this feel-good chemical, it is best to eat complex carbohydrates, which are digested more slowly and have a lower glycemic index. Good choices include whole grain breakfast cereals, breads, and pastas, as well as old-fashioned oatmeal. Complex carbohydrates can also help one feel balanced by stabilizing blood sugar levels. Carbohydrates at bedtime can speed the release of serotonin and help one sleep better. Because heavy meals before bed can trigger heartburn, stick to something light, such as fruit and low-fat yogurt. Another bedtime stress buster is a glass of warm milk. Research shows that calcium eases anxiety and mood swings linked to premenstrual syndrome (PMS). The authors recommend organic, skim, or low-fat milk.

Oranges provide vitamin C. Studies have demonstrated that this vitamin can curb levels of stress hormones while strengthening the immune system. In a study of people with high blood pressure, high cortisol levels (a stress hormone) returned to normal quicker when people took vitamin C.

Crunchy raw vegetables can help ease stress in a purely mechanical way. Munching celery or carrot sticks helps release a clenched jaw and may ward off tension. Spinach and all green leafy vegetables are a good source of magnesium. Insufficient magnesium may trigger headaches and fatigue, compounding the effects of stress. Cooked organic soybeans or a filet of salmon can also provide magnesium.

Omega-3 fatty acids, found in fish such as salmon and tuna, can prevent increases in stress hormones and may help protect against heart disease, mood disorders like depression, and PMS. For a steady supply of feel-good omega-3s, aim to eat 3 ounces of fatty fish at least twice a week.

Pistachios, as well as other nuts and seeds, are good sources of healthy fats. Eating a handful of pistachios, walnuts, or almonds may help lower cholesterol, ease inflammation, reduce the risk of diabetes, and help protect against the effects of stress. Almonds are full of helpful vitamins: vitamin E to increase the immune system, plus B vitamins, which may make one more resilient during bouts of stress such as depression. Snack on a quarter of a cup every day.

Drinking black or green tea may help one recover from stressful events more quickly. One study compared people who drank 4 cups of tea daily for 6 weeks with people who drank another beverage. The tea drinkers reported feeling calmer and had lower levels of the stress hormone cortisol after stressful situations. When it comes to stress, the caffeine (in coffee) can boost stress hormones and raise blood pressure.

Caffeine can be responsible for inducing the first stage of stress (alarm stage). Caffeine is also responsible for making people hyperactive and nervous. Because of this, the person's sleeping pattern can be affected significantly by caffeine. If one has trouble controlling stress and always feels tired, one should look at his or her diet to see if there are any nutrient deficiencies or insufficiency. When the body is under stress, it has been proven that the body uses up its resources until they are finished. Following a diet plan will strengthen the body against stress and other illnesses.

The following are the main nutrients that the body will use up

1. B vitamins. These help the body cope with stress (build metabolism) and control the whole nervous system
2. Proteins. Assist in growth and tissue repair
3. Vitamin A. Essential for normal vision
4. Vitamin C. Protection of the immune system (eg, antioxidants and diabetes protection), lowers the amount of cortisol in the body
5. Magnesium. Needed for a variety of tasks such as muscle relaxation, fatty acid formation, making new cells, and heartbeat regulation

There are many herbal supplements that claim to fight stress. One of the best studied is St. John's Wort, which has shown benefits for people with mild-to-moderate depression. This herb also appears to reduce symptoms of anxiety and PMS. Valerian root is another herb that has a calming effect. Health care providers should be told about any supplements a patient is taking, especially herbs, so they can check on any possible interactions with any medication.

DIETARY TIPS TO IMPROVE DIET TO HELP COPE WITH STRESS

Tip # 1 Eat a Variety of Different Color Foods

The colors and their intensity are a guide to the variety of phytochemical (pigments) and their concentrations.

The color blue/purple on fruits and vegetables reveals the presence of natural plant phytochemicals called anthocyanins, which act as powerful antioxidants, protecting cells from damage. In general terms, the darker the color means the higher the phytochemical concentration. Anthocyanins have been shown to have a role in the support of healthy blood pressure, the prevention of blood clot formations, the improvement of memory function, and in lowering the risk of cancer.¹⁸⁻²⁰

Blue/purple on fruits and vegetables also shows that they contain flavonoids that support blood vessels, help prevent short term memory loss, and even prevent urinary infections by precluding bacteria from sticking in the epithelium of the urinary tract.

Green fruits and vegetables reveal chlorophyll content. Another phytochemical found in green colored food is lutein, which is important for eye health. Lutein works with zeaxanthin (found in corn, red peppers, and grapes) to reduce the risk of cataracts and macular degeneration.²¹

Other nutrients present in green food include the indoles in broccoli, cabbage, and other cruciferous vegetables, which may help protect against some types of cancer.²²

Many green plant foods are also rich in isothiocyanates, which stimulate enzymes in the liver that assist the body in removing potentially carcinogenic compounds. Greens (especially dark leaves) are also rich sources of folate, vitamin K, potassium, some carotenoids, and omega-3 fatty acids.

Red fruits and vegetables reveal lycopene and anthocyanins. Lycopene is a powerful antioxidant that is found in plants such as tomatoes, watermelon, and pink grapefruit. Anthocyanin is found in fruits such as strawberries, raspberries, and red grapes and has powerful antioxidant activity. Lycopene is believed to reduce risk of myocardial infarcts and certain types of cancer, especially prostate.^{23,24}

Yellow/orange

Orange/yellow fruits and vegetables reveal carotenoids. Beta-cryptoxanthin, beta-carotene, and alpha-carotene are all orange-friendly carotenoids that can be converted in the body to vitamin A. Vitamin A is important for vision and immune function,

as well as skin health. There are scientific reports on carotenoid-rich foods helping to reduce the risk of cardiovascular disease and some cancer.^{25,26}

In conclusion, many phytonutrients are essential in helping the body fight oxidation and degenerative diseases.

Tip #2 Eat Antioxidant-Containing Foods

Most phytochemicals are known to have antioxidant activity. Free radicals are oxygen molecules with an aberrant electron. Metabolically speaking, this unbalanced electron configuration causes damage to the following: cell membranes, DNA, RNA, and mitochondria. Free radicals are a hazard to the body's integrity at the cellular and tissue level. They have been associated with the development of cancer and heart disease, and other diseases as well. Antioxidants destroy free radicals. The 4 major antioxidants are: carotenes (precursors to vitamin A) vitamin C, vitamin E, and the mineral, selenium. Antioxidants are found mostly in fruits and vegetables.

Tip # 3 Choose Organic Foods (Whenever Possible)

In simplest terms, currently available foods are full of chemicals: synthetic fertilizers, pesticides, herbicides, and fungicides. Organic foods will largely reduce the burden of contaminants.

Tip #4 Drink Filtered Water

In general, people are usually dehydrated. People do not drink enough water! Many beverages (eg, coffee, tea, sodas) act as diuretics, meaning they increase the loss of water through urination, thus promoting dehydration. Various studies show that the water supply is not as clean as it should be. City drinking water may contain sizable traces of antibiotics, hormones, and chemicals.

It is in the best interest to install a high-end water filter system to be used for all drinking water (and cooking). Remember to replace the filter once a year (or as often as needed). One should also know that there is no federal regulation on bottled water. Most bottled water is ordinary tap water, sitting in plastic containers on pallets, stored in warehouses months before store delivery. It might be best to carry one's own filtered water in a suitable water bottle.

The importance of being hydrated cannot be overemphasized. Water helps flush out metabolites, waste products, and toxins for elimination. Dehydration will compromise this process. How much water is enough per day?

The authors suggest the best indication of being hydrated is producing near-clear urine (since dark urine may be a sign of dehydration).

Tip # 5 Eat Herbs and Spices

Use fresh spices and herbs to cook and in salads. Prepare a backyard garden with herb plants that may include rosemary, thyme, sage, cilantro, oregano, garlic, and many others. These spices and herbs are not only added for taste, they have health benefits (essential oils of herbs enhance the immune system and may have antimicrobial and other beneficial properties). The leaves, stems, and roots of these plants contain phytochemicals such as bio-flavonoids and antioxidants. There are several mushrooms (shitake, maitake and reishi) that are known to enhance the immune system as well.^{27,28}

Tip # 6 Consume Free Range Meats and Poultry and Wild Caught Fish

Free range means that the cattle are allowed to eat as they roam around the pasture for their entire lives. Nonfree range refers to those animals that are raised on factory

farms, live in overcrowded conditions and fed corn and other grains. Once again, corn is not a food source and is not found in their normal diet. The problem is that it may contain synthetic fertilizers, herbicides, fungicides, or pesticides. Also, living in such close quarters gives rise to infections; hence more antibiotics are used even prophylactically. Hormones and steroids are also given to increase yield. As for the consumption of beef, chicken, mutton, pork, and salmon, the best way to go is organic.

Tip # 7 Eat Fiber

Fiber (roughage) is found in fruits, vegetables, grains, and legumes (eg, peas, beans, and lentils). These are complex carbohydrates that are not digestible. Fiber sweeps out both the small and large intestine, carrying fat molecules (which is why fiber is said to lower cholesterol) and toxins. The World Health Organization suggests that each person consume 30 to 40 g of fiber a day. One should try to consume a good amount of fruits and vegetables each day.

Tip #8 Consume Omega 3s

Omega 3 and omega 6 oils are essential fatty acids. This means that one's body cannot produce them, and hence they must be obtained from the diet.

People have an imbalance of fatty acids in their diet; it is overloaded with omega 6s (vegetable oils) and severely lacking in omega 3. The standard American diet, which is high in omega 6 oils, tends to favor inflammation. Sources of omega 3s include cold-water fish (eg, salmon, cod, and tuna), flax seed oil, and walnuts. Omega 3 fats act as anti-inflammatory agents. They are also essential for brain cells and the retina. DHA comprises about 97% of all the omega-3 fatty acids in the human brain and 93% of those in the retina. Low concentrations of eicosapentaenoic acid (EPA) and DHA have been shown to result in an increased risk of death from all causes and accelerate cognitive decline.²⁹⁻³² There is evidence that omega 3 oils may also help to prevent and combat cancer. If one chooses salmon, the authors recommend buying wild Alaska salmon or Norwegian salmon, not farm-bred salmon. The latter is known to have a high polychlorinated biphenyl content (a known carcinogen).

Tip # 9 Take a Multivitamin and Mineral Formula with a High Content of B-Complex

B-complex vitamins are known to act as a stress fighter vitamin, because many of the B vitamins are used to assist metabolic processes for energy production (fight or flight).

SUMMARY

The impact that stress can have on one's health is serious and can cause problems to every major system of the body. With the right nutrition, one can reduce the impact that stress has on the body and effectively repair any damage that has been done. Proper nutrition prepares the body for any stress. When the body becomes stressed, it craves foods that are high in fats and sugars. These are the foods that need to be avoided, as they only provide someone with a small burst of energy, which will result in a long period of fatigue. On the other hand, a high-fiber diet rich in fresh fruits, vegetables, nuts, and whole grains provides greater appetite satisfaction over a longer period than processed, high-fat, and high-sugar snacks. But even more important, when one replaces junk foods with fresh, high-fiber plant foods, one is more likely to consume greater amounts of vitamins A, B6, and C, and the B vitamins niacin, thiamin, riboflavin, and folate. One will also have a higher intake of magnesium, iron, selenium, zinc, phosphorus, and calcium. These nutrients are all vital to a healthy metabolism and provide significant stress protection.

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