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Vitamin B2, also called riboflavin, is an important vitamin that also acts as an antioxidant within the body. Because it’s a water-soluble vitamin, like all B vitamins, vitamin B2 must be obtained through a healthy diet and replenished often — ideally every day — in order to avoid vitamin B2 deficiency. All B vitamins are used to help digest and extract energy from the foods you eat. They do this by converting nutrients from carbohydrates, fats and proteins into useable energy in the form of “ATP.” For this reason, vitamin B2 is needed for the functioning of every single cell within your body. That’s why vitamin B2 deficiency, or lack of riboflavin foods in your diet, can contribute to a number of serious side effects, including anemia, fatigue and a sluggish metabolism. What Is Riboflavin? What does vitamin B2 do? Roles of vitamin B2 include: maintaining healthy blood cells boosting energy levels facilitating in a healthy metabolism preventing free radical damage contributing to growth protecting skin and eye health and much more Vitamin B2 is used in combination with other B vitamins, which make up the “B vitamin complex.” In fact, B2 must be present in high enough amounts in the body to allow other B vitamins, including B6 and folic acid, to properly do their jobs.Ad All B vitamins are responsible for important functions, including contributing to nerve, heart, blood, skin and eye health; reducing inflammation; and supporting hormonal function. One of the most well-known roles of B vitamins is maintaining a healthy metabolism and digestive system. Vitamin B2/riboflavin has been shown to act like an antioxidant nutrient. It helps prevent lipid peroxidation and oxidative injury, both of which contribute to chronic health problems, such as cardiovascular disease and neurological diseases. Vitamin B2 also plays an important role in enzymatic reactions. There are two coenzyme forms of riboflavin: flavin mononucleotide and flavin adenine dinucleotide. Health Benefits 1. Helps Prevent Headaches, Including Migraines Vitamin B2 is a proven method for dealing with painful migraine headaches. Physicians commonly prescribe riboflavin in high doses of 400 milligrams daily for at least three months as a preventive treatment for headaches or as a remedy for those who regularly experience serious migraine attacks. Supplementing with riboflavin, especially if you have a known vitamin B2 deficiency, has been shown to be a natural headache remedy and reduce the frequency of migraines. One review of 11 articles concluded that supplementing with riboflavin was effective at reducing the duration and frequency of migraine symptoms with minimal risk of side effects. Another study had similar findings, showing that taking a high dosage of riboflavin cut migraine frequency in half and reduced the need for medications after just three months of treatment. One type of combination product that contains riboflavin, magnesium and coenzyme Q10, called Dolovent, is now used to manage migraine symptoms when taken in dose of four capsules daily (two capsules in the morning and two capsules in the evening for three months). 2. Helps Support Eye Health Studies show that riboflavin deficiency increases the risk for certain eye problems, including glaucoma. Glaucoma is the leading cause of loss of eyesight/blindness. Vitamin B2 can help prevent eye disorders, including cataracts, keratoconus and glaucoma. Research shows a correlation between people who consume plenty of riboflavin and decreased risks for eye disorders that can appear as someone ages. To treat eye disorders, riboflavin drops are applied to the corneal surface of a patient who suffers from glaucoma. This allows the vitamin to penetrate through the cornea and increase the strength of the cornea when used with light therapy. 3. Boost Heart Health One of the most impressive riboflavin benefits is its powerful effect on heart health. Riboflavin works by regulating levels of homocysteine, an amino acid found throughout the body. When homocysteine builds up in the blood, it can cause arteries to narrow and skyrocket the risk of heart disease, making it vital to keep homocysteine levels under control. Several studies have demonstrated the direct impact that riboflavin may have on heart health. One animal model published in Heart International, for instance, showed that riboflavin treatment helped improve heart function in rats with heart failure caused by diabetes. Meanwhile, other studies have also found that riboflavin deficiencies are more prevalent in people with heart disease, and a deficiency could be linked to a higher risk of congenital heart defects. 4. Can Help Prevent and Treat Anemia Anemia is caused by several factors, including decreased red cell production, the inability to carry oxygen to the blood and blood loss. Is riboflavin good or bad for you if you suffer from anemia? Vitamin B2 is involved in all of these functions and helps prevent and treat cases of anemia. Vitamin B2 is required for steroid hormone synthesis and red blood cell production. It also helps the transportation of oxygen to the cells and helps mobilize iron. When people experience riboflavin deficiency without enough vitamin B2 present in their diets, they become more at risk for developing anemia and sickle cell anemia.Ad Low levels of vitamin B2 are correlated with both of these conditions that involve an underutilization of oxygen and problems with red blood cell production. These conditions can result in fatigue, shortness of breath, inability to exercise and more. Research suggests that vitamin B2 is also effective in helping lower high amounts of homocysteine in the blood. This condition occurs when someone is unable to convert the chemical homocysteine present in blood into amino acids for the body to use. Supplementing with vitamin B2 (riboflavin) has been shown to help correct this condition and balance homocysteine levels. 5. Needed for Maintaining Proper Energy Levels Riboflavin is considered a vital component of mitochondrial energy. Vitamin B2 is used by the body to metabolize food for energy and maintain proper brain, nerve, digestive and hormone function. This is why riboflavin is very important for growth and bodily repair. Without high enough levels of riboflavin, riboflavin deficiency occurs, and the molecules found in carbohydrate, fat and protein foods are not able to be properly digested and used for “fuel” that keeps the body running. This type of bodily “fuel” is called ATP (or adenosine triphosphate), often called the “currency of life.” The predominant role of mitochondria is the production of ATP. Vitamin B2 is needed in order to break down proteins into amino acids, fats and carbohydrates in the form of glucose. This helps convert nutrients from food into usable bodily energy that helps maintain a healthy metabolism. Riboflavin is also needed to regulate proper thyroid activity and adrenal function. A riboflavin deficiency can increase the odds of thyroid disease. It also is useful in calming the nervous system, battling chronic stress, and regulating hormones that control appetite, energy, mood, temperature and more. 6. Provides Antioxidant Properties and Defends Against Cancer Studies have found that vitamin B2 intake is inversely associated with with some of the most common types of cancer, including colon cancer and breast cancer. Vitamin B2 benefits the immune system because it acts as an antioxidant that controls the presence of damaging free radicals within the body. Vitamin B2 riboflavin is required for the production of an antioxidant called glutathione, which acts as a free radical killer and also detoxes the liver. Free radicals are what age the body. When they go uncontrolled, it can result in the development of various disease. Vitamin B2 plays a part in defending against disease by maintaining a healthy lining within the digestive tract, where much of the immune system is stored. A healthy digestive system allows the body to absorb and use the most nutrients from your diet that it can. Thus, a riboflavin deficiency can mean fewer nutrients properly being used for bodily energy. Riboflavin and other B vitamins are correlated in preliminary studies with helping to prevent certain types of cancer — including colorectal cancer, esophageal cancer, cervical cancer, breast cancer and prostate cancer. Although more research is still needed to know the exact role of riboflavin in cancer prevention, at this time researchers believe that vitamin B2 works to minimize the effects of cancer-producing carcinogens and oxidative stress caused by free radicals. 7. Protects Healthy Hair and Skin Vitamin B2 riboflavin plays a role in maintaining collagen levels, which makes up healthy skin and hair. Collagen is needed to maintain the youthful structure of skin and prevent fine lines and wrinkles. A riboflavin deficiency can make us look aged quicker. Some research suggests that riboflavin can decrease the time needed for wound healing, reduce skin inflammation and cracked lips, and help naturally slow signs of aging. 8. May Help Prevent Neurological Diseases Evidence suggests that vitamin B2 may exert a neuroprotective effect and offer protection against some neurological disorders, such as Parkinson’s disease, migraines and multiple sclerosis. Researchers posit that vitamin B2 has a role in some pathways that are hypothesized to be impaired in neurological disorders. For example, vitamin B2 serves as an antioxidant and assists myelin formation, mitochondrial function and iron metabolism. Uses in Traditional Medicine English biochemist Alexander Wynter Blyth was the first to observe vitamin B2/riboflavin in 1872 when he noticed a green-yellow pigment found in milk. However, it wasn’t until the early 1930s that riboflavin was actually identified by Paul Gyorgy, the same biochemist credited with the discovery of other B vitamins like biotin and vitamin B6. Even before vitamin B2 was isolated by scientists, practitioners of traditional medicine systems, such as Ayurveda, recommended foods that were high in B vitamins to improve energy, functioning of the nervous system, and health of the eyes, skin, hair and liver. Vitamin B2 foods, including meat, organ meats like liver, dairy such as yogurt, eggs, nuts like almonds, mushrooms, and green vegetables were viewed as important for slowing the aging process and promoting growth in the young. These foods are still recommended for people with migraines, anemia, sluggish metabolisms and weakened immune systems. In Traditional Chinese Medicine, vitamin B2 foods are considered essential for dealing with stress and helping your body use other nutrients, including folate and vitamin B12. To maintain healthy levels of red blood cells, prevent fatigue and support the metabolism, it’s recommended that a balanced diet include B2 foods like meats, organ meats, eggs, soybeans (fermented types), spinach, beet greens, broccoli, bok choy, shiitake mushrooms and tempeh. Riboflavin Foods What foods contain vitamin B2? Although it’s primarily found in meat and dairy products, vitamin B2/riboflavin is found in plant foods like legumes, vegetables, nuts and grains. Riboflavin and other B vitamins are also usually found in most fortified whole-grain and enriched carbohydrate products, including breads, cereals, granola bars and pastas. Normally these foods are enriched with vitamins and minerals, including vitamin B2 riboflavin, after they have been processed and many of the naturally occurring nutrients have been either removed or destroyed. Because many people commonly consume packaged and refined carbohydrate products, this is the main reason most adults are able to meet their daily requirement for riboflavin in most situations and avoid riboflavin deficiency. When you acquire vitamin B2 in this way, you consume a synthetic version of the vitamin that’s been purposefully added to food. Products that synthetically add vitamins and minerals say the words “enriched” or “fortified” on the packaging. This is unlike unprocessed products that naturally contain B vitamins, like meat, eggs and seaweed. Here are a few of the top riboflavin foods to add into your diet: Beef Liver — 3 ounces: 3 milligrams (168 percent DV*) Natural Yogurt —1 cup: 0.6 milligram (34 percent DV*) Milk — 1 cup: 0.4 milligram (26 percent DV*) Spinach — 1 cup, cooked: 0.4 milligram (25 percent DV*) Almonds — 1 ounce: 0.3 milligram (17 percent DV*) Sun-Dried Tomatoes — 1 cup: 0.3 milligram (16 percent DV*) Eggs — 1 large: 0.2 milligram (14 percent DV*) Feta Cheese — 1 ounce: 0.2 milligram (14 percent DV*) Lamb — 3 ounces: 0.2 milligram (13 percent DV*) Quinoa — 1 cup, cooked: 0.2 milligram (12 percent DV*) Lentils — 1 cup, cooked: 0.1 milligram (9 percent DV*) Mushrooms — 1/2 cup: 0.1 milligram (8 percent DV*) Tahini — 2 tablespoons: 0.1 milligram (8 percent DV*) Wild-Caught Salmon — 3 ounces: 0.1 milligrams (7 percent DV*) Kidney Beans — 1 cup, cooked: 0.1 milligrams (6 percent DV*) *Daily Value: Percentages are based on a diet of 2,000 calories a day. B2 Deficiency A deficiency in this key vitamin can take a serious toll on many aspects of health. However, riboflavin deficiencies alone are very rare. Instead, riboflavin deficiencies are often coupled with deficiencies in other water-soluble vitamins, such as thiamine and niacin. Alcoholics are at a greater risk of deficiency due to both a decreased intake and impaired vitamin absorption. Additionally, individuals who don’t consume meat or dairy and those with dietary restrictions may be at an increased risk. Some of the most common riboflavin deficiency symptoms include: Sore throat Cracks in the lips and corners of the mouth Swollen tongue Scaly skin Redness of the lining of the mouth and throat Weakness Riboflavin levels are not typically included in routine blood tests, so it’s important to talk to your doctor if you notice any symptoms or are at an increased risk of riboflavin deficiency. Together you can determine the best course of treatment to ensure you’re getting enough riboflavin to meet your needs. Supplements and Dosage According to the USDA, the daily recommended allowance of vitamin B2/riboflavin is as follows: Infants: 0–6 months: 0.3 mg/day 7–12 months: 0.4 mg/day Children: 1–3 years: 0.5 mg/day 4–8 years: 0.6 mg/day 9–13 years: 0.9 mg/day Adolescents and adults: Males age 14 and older: 1.3 mg/day Females age 14–18 years: 1 mg/day Females age 19 and older: 1.1 mg/day While supplementing with B vitamins can be helpful, keep in mind that it’s always best to still aim to consume plenty of whole foods that naturally contain vitamin B2 and other essential nutrients. By eating a balanced diet that contains a variety of unprocessed, nutrient-dense foods, most people seem to acquire enough vitamin B2 and avoid vitamin B2 deficiency. If you take a supplement that contains riboflavin, be sure to purchase a high-quality product that is made from real food sources. Research shows that consuming vitamin B2 along with a meal increases the absorption of the vitamin significantly. This is true of most vitamins and minerals. They are absorbed much better by the body with a meal. Risks and Side Effects Because riboflavin is a water-soluble vitamin, there is minimal risk of toxicity as excess amounts are excreted through the urine. In fact, one study even showed that administering 400 milligrams of riboflavin per day to participants, which is over 200 times the recommended daily value, resulted in no negative side effects. While riboflavin supplementation is available, including more foods high in vitamin B in your diet is typically a better option. Not only do these foods with vitamin B contain a good amount of riboflavin, but they also provide a host of other important vitamins and minerals as well to help improve your health. If you suspect you may have a riboflavin deficiency, it’s best to talk to your doctor to determine the best course of treatment. Because riboflavin deficiencies typically occur alongside other micronutrient deficiencies, you may require supplementation with other B vitamins as well. That said, research suggests that taking certain medications may impact the absorption rate of vitamin B2 in the body, potentially causing side effects. While these interactions are only known to be minor, they are something you want to speak with your healthcare professional about if you take any of the following prescription medications: Drying medications (anticholinergic drugs) — These can affect the stomach and intestines and can increase the amount of riboflavin that is absorbed in the body. Medications for depression (tricyclic antidepressants) — It’s possible that these can decrease the amount of riboflavin in the body. Phenobarbital (Luminal) — Phenobarbital might increase how quickly riboflavin is broken down in the body. Probenecid (Benemid) — It can increase how much riboflavin is absorbed in the body, possibly causing too much to linger, which can be problematic. Final Thoughts Vitamin B2/riboflavin is an important water-soluble vitamin that plays a role in many aspects of health, especially energy production, neurological health, iron metabolism and immune system function. Vitamin B2 benefits include improvements in heart health, relief from migraine symptoms, protection against vision loss and neurological diseases, healthier hair and skin, and protection against certain types of cancer. Some of the top vitamin B2 foods include meat, fish, dairy and legumes. Riboflavin is also found in nuts, seeds and certain vegetables. Vitamin B2 deficiency is rare in most developed nations because vitamin B2 foods, such as meat, dairy, eggs, fish, legumes and certain vegetables, are usually available. Although meeting your needs through food sources is preferable, supplementation is also available. Vitamin B2 is also generally present in both multivitamins and B-complex capsules, making it simple to meet your daily needs. RoleSourcesDeficiencyRisksVitamin B2 is an essential B vitamin for human health. People may also refer to it as riboflavin. Health benefits of vitamin B2 include supporting cellular functions that provide the body with energy, allowing it to work efficiently.Vitamin B2 is a water-soluble vitamin, so it dissolves in water. All vitamins are either water soluble or fat soluble. Water-soluble vitamins are carried through the bloodstream, and whatever is not needed passes out of the body in urine.People need to consume vitamin B2 every day, because the body can only store small amounts, and supplies go down rapidly.Riboflavin occurs naturally in some foods, added to others, and it can be taken as supplements. Most of it is absorbed in the small intestine.Share on PinterestCruciferous vegetables are a source of vitamin B2, but steam them rather than boiling them.Vitamin B2 helps break down proteins, fats, and carbohydrates. It plays a vital role in maintaining the body’s energy supply.Riboflavin helps convert carbohydrates into adenosine triphosphate (ATP). The human body produces ATP from food, and ATP produces energy as the body requires it. The compound ATP is vital for storing energy in muscles.Along with vitamin A, vitamin B is essential for:Maintaining the mucous membranes in the digestive systemMaintaining a healthy liverConverting tryptophan into niacin, an amino acidKeeping the eyes, nerves, muscles and skin healthyAbsorbing and activating iron, folic acid, and vitamins B1, B3 and B6Hormone production by the adrenal glandsPreventing the development of cataractsFetal development, especially in areas where vitamin deficiency is commonSome research suggests that vitamin B2 may help prevent cataracts and migraine headache, but further studies are needed to confirm this.Other studies have found that in children with autism, supplements of vitamins B2, B6, and magnesium appear to reduce the levels of abnormal organic acids in the urine.Vitamin B2 comes from food.Share on PinterestMeat, fish, and dairy products provide vitamin B2.Fish, meat, and poultry, such as turkey, chicken, beef, kidneys, and liverEggsDairy productsAsparagusArtichokesAvocadosCayenneCurrantsFortified cerealsKelpLima beans, navy beans, and peasMolassesMushroomsNutsParsleyPumpkinsRosehipsSageSweet potatoesCruciferous vegetables, such as broccoli, Brussels sprouts, spinach, dandelion greens, and watercressWhole-grain breads, enriched breads, and wheat branYeast extractVitamin B2 is water soluble, so cooking foods can cause it to be lost. About twice as much B2 is lost through boiling as it is through steaming or microwaving.According to Oregon State University, the recommended daily allowance (RDA) of vitamin B2 in for men aged 19 years and over is 1.3 milligrams per day, and for women, it is 1.1 milligram per day. During pregnancy, women should have 1.4 milligrams per day, and when breastfeeding, 1.6 milligrams per day.Vitamin B2 deficiency is a significant risk when diet is poor, because the human body excretes the vitamin continuously, so it is not stored. A person who has a B2 deficiency normally lacks other vitamins too.There are two types of riboflavin deficiency:Primary riboflavin deficiency happens when the person’s diet is poor in vitamin B2Secondary riboflavin deficiency happens for another reason, maybe because the intestines cannot absorb the vitamin properly, or the body cannot use it, or because it is being excreted too rapidlyRiboflavin deficiency is also known as ariboflavinosis.Signs and symptoms of deficiency include:Angular cheilitis, or cracks at the corners of the mouthCracked lipsDry skinInflammation of the lining of the mouthInflammation of the tongueMouth ulcersRed lipsSore throatScrotal dermatitisFluid in mucous membranesIron-deficiency anemiaEyes may be sensitive to bright light, and they may be itchy, watery, or bloodshotPeople who drink excessive amounts of alcohol are at greater risk of vitamin B deficiency.Normally, vitamin B2 is considered safe. An overdose is unlikely, as the body can absorb up to around 27 milligrams of riboflavin, and it expels any additional amounts in the urine.However, it is important to talk to a physician before taking any supplements, especially as these can interfere with other medications.Supplements can interact with other medications, and B2 supplements may impact the effectiveness of some drugs, such as anticholinergic medications and tetracycline.Sometimes a doctor may recommend supplementation, for example, if a patient is using a drug that can interfere with the absorption of riboflavin.Drugs that may interfere with riboflavin levels in the body include:Tricyclic antidepressants, such as imipramine, or TofranilSome antipsychotic drugs, such as chlorpromazine, or ThorazineMethotrexate, used for cancer and autoimmune diseases, such as rheumatoid arthritisPhenytoin, or Dilantin, used to control seizuresProbenecid, for goutThiazide diuretics, or water pillsDoxorubicin, a drug used in cancer therapy, may deplete levels of riboflavin, and riboflavin may affect how doxorubicin works.The University of Maryland Medical Center (UMM) note that very high amounts of vitamin B2 may lead to itching, numbness, burning or prickling, yellow or orange urine and sensitivity to light. To prevent an imbalance of B vitamins, they suggest using a B-complex vitamin if supplementation is needed. Jump to:It’s hard to go a day without someone on social media declaring that you’re probably deficient in a vitamin and need to take a supplement. While it’s easy to get immune to concerns about nutrient deficiencies, as a result, these do happen. One to have on your radar is signs of a vitamin B2 deficiency.Also known as riboflavin, vitamin B2 deficiency isn’t overly common in the U.S. However, having an underlying thyroid issue, being a vegetarian or vegan, and being pregnant or breastfeeding may raise your risk of being deficient in riboflavin, according to the National Institutes of Health (NIH). Meet the experts: Ife J. Rodney, M.D., is a dermatologist and founding director of Eternal Dermatology + Aesthetics; Christine Greves, M.D., is an ob/gyn at the Winnie Palmer Hospital for Women and Babies in Orlando, Fla; Scott Keatley, R.D., co-owner of Keatley Medical Nutrition Therapy; Jessica Cording, R.D., author of The Little Book of Game-Changers; and Keri Gans, R.D.N., dietitian and host of The Keri Report podcastVitamin B2 plays a role in a range of processes in the body, including your energy levels and metabolism, per the U.S. National Library of Medicine. It’s also crucial for normal cell growth and function. The recommended daily allowance of riboflavin is 1.1 milligrams for most adult women (that jumps to 1.4 milligrams and 1.6 milligrams when you’re pregnant and breastfeeding, respectively), and 1.3 milligrams for most adult men.Unfortunately, if you’re consistently falling short of that amount, you may end up dealing with uncomfortable symptoms. Vitamin B2 isn’t a nutrient most people are familiar with, and it’s fair to be unclear on what the signs of a riboflavin deficiency actually are. Here’s what you need to know. Some symptoms of low vitamin B2 overlap with a slew of underlying health conditions, making it tricky to say for sure if you’re dealing with a vitamin B2 deficiency or something else. But if you notice one or several of these at once, it’s worth consulting a healthcare professional for a deeper dive into your health. FatigueThe cause of fatigue is an admittedly tough thing to pin down. Have you been working out too hard? Are you getting enough iron? Is your sleep off? Or is it your vitamin B2 levels? You can develop anemia, a condition where your body doesn’t have enough healthy red blood cells, when you have too-low levels of riboflavin over a longer period of time, according to the NIH. Among other things, that can make you feel weak and fatigued. But there’s another reason why a lack of riboflavin can make you feel tired, according to Keri Gans, R.D.N., dietitian and host of The Keri Report podcast. “Riboflavin helps your body convert carbohydrates into fuel and plays a big role in how your cells produce energy,” she says. “Fatigue can happen when that process breaks down.”Cracked lipsAgain, this may be due to something else, including not taking in enough liquids regularly. But cracked lips may also be a sign of low B2, according to Ife J. Rodney, M.D., a dermatologist and founding director of Eternal Dermatology + Aesthetics. “Riboflavin helps with moisture retention,” she says. If you’re low in the nutrient, your lips’ natural moisture can suffer as a result, leading to cracking and even bleeding. Crusty corners of the mouthThis is a more unique symptom of riboflavin deficiency, leading to lesions at the corners of your mouth. “You may get scaling or cracking in the corners of the mouth,” Dr. Rodney says. (This may even show up in the corners of your mouth and ears, she adds.) Scaly patches on your skinScaly patches can be a symptom of several skin conditions, but they may also be due to a lack of B2. “Riboflavin helps with tissue repair and cell turnover,” Dr. Rodney explains. “Any time you have issues with tissue repair or cell turnover, that’s when you get cracking or scaling.” These scaly patches will often look red or discolored from your usual skin color, she says. Sore throatRiboflavin deficiency may cause swelling in your mouth and throat, making it feel like you have a sore throat, according to the NIH. “Since riboflavin is also crucial for overall cell function, low levels can affect fast-healing areas like the skin and mouth, leading to symptoms like a sore throat,” Gans says. Unexplained hair lossThat cell turnover that can impact the health of your lips and skin may also affect your hair, Dr. Rodney says. When you don’t have enough riboflavin, it can impact the production of collagen, a type of protein that supports hair follicle (and skin) health.Reproductive issuesFertility is incredibly complicated, and it’s hard to say that adding more B2 to your diet will magically help you conceive. But not having enough riboflavin can interfere with several areas of reproduction, including the development of sperm and eggs, and ovulation, along with early development of the embryo, says Christine Greves, M.D., an ob/gyn at the Winnie Palmer Hospital for Women and Babies in Orlando, Fla. (Worth noting: Many prenatal vitamins contain riboflavin.) Still, this isn’t usually a go-to solution for doctors when you’re struggling to conceive. “I don’t ask someone when they’re trying to get pregnant if they’re taking riboflavin,” Dr. Greves says. “But I do say that you should be having well-balanced meals.”Ultimately, if you suspect you might have a vitamin B2 deficiency, it’s important to see a healthcare provider for a proper evaluation. “A blood test is the gold standard,” says Jessica Cording, R.D., author of The Little Book of Game-Changers. “This will give you information on how deficient you may be.” You and your healthcare provider can make decisions on next steps from there. There are a few food sources of vitamin B2 to consider adding to your diet. According to the NIH, some of the biggest ones include: Beef liver, 3 ounces, 2.9 milligrams Fortified breakfast cereals, 1 serving, 1.3 milligrams Oats, 1 cup, 1.1 milligrams Plain yogurt, 1 cup, 0.6 milligrams 2% milk, 1 cup, 0.5 milligramsB2 recommendations vary slightly by age, sex, and life phase. Most genetic adult women need 1.1 milligrams a day of riboflavin, according to the NIH. However, those who are pregnant need 1.4 milligrams and those who are breastfeeding need 1.6 milligrams. Most genetic adult men need 1.3 milligrams daily of riboflavin, per the NIH. Adding more B2-rich foods to your diet can help, Dr. Rodney says. “I recommend mostly focusing on your diet,” she says. If that doesn’t seem to help, she says a supplement may work—just consult a healthcare provider first about the proper dosing. There are a few things that may happen when you take vitamin B2. “Some individuals experience digestive discomfort, nausea, or bloating,” says Scott Keatley, R.D., co-owner of Keatley Medical Nutrition Therapy. (Taking it on an empty stomach may make this worse, he says.) Something else to consider, per Keatley: “Excess riboflavin can turn urine bright yellow, which is harmless but sometimes alarming.” That said, you’re likely to just pee out the riboflavin you don’t need. “B2 is a water-soluble vitamin, so excess amounts are typically excreted in urine,” Gans says.Overall, Cording stresses the importance of only taking a supplement under the guidance of a healthcare provider. “It’s the best way to go,” she says. Dietary supplements are products intended to supplement the diet. They are not medicines and are not intended to treat, diagnose, mitigate, prevent, or cure diseases. Be cautious about taking dietary supplements if you are pregnant or nursing. Also, be careful about giving supplements to a child, unless recommended by their healthcare provider. B-2 Images and VideosGo to Media Gallery >>B-2 Images and VideosGo to Media Gallery >>Page 2 To bring the B-2 to life, Northrop Grumman had to invent all components from scratch. That list included tools, a software laboratory, composite materials, special test equipment, and 3-D modeling and computer systems. Related manufacturing processes were also created. 2 – Why it’s No. #1 When the U.S. must go to war, the B-2 is there on the first night. The B-2 went into enemy territory on Night One in support of Operation Allied Force (Serbia); Operation Enduring Freedom (Afghanistan); Operation Iraqi Freedom (Iraq) and twice in Libya in support of Operation Odyssey Dawn and Operation Odyssey Lightning. The B-2, one of the most survivable aircraft in the world, is the only aircraft to combine long-range, stealth and a heavy payload on a single platform. 3 – Legendary Combat Debut The B-2 saw its first operational use during Operation Allied Force. Two B-2s flew more than 31 hours from Whiteman Air Force Base in Missouri to Kosovo. They attacked multiple targets, then flew directly back. The B-2s flew less than 1 percent of the total missions, yet destroyed 33 percent of the targets during the first eight weeks of conflict. 4 – Beast Mode: Longest Aerial Combat Mission in History The B-2 holds the record for longest air combat mission in history. In 2001, the Spirit of America and five other B-2s were the first to enter Afghan airspace for a record setting 44-hour mission. The aircraft’s performance is even more impressive in that the B-2 made a quick pit stop for a 45-minute crew and service change with engines still running. It then flew back to Missouri for another 30-hour flight for a total of more than 70 consecutive hours. 5 – Red Carpet Realness When Hollywood needs a “super bomber” to make a cameo and fight off a giant monster or an alien invasion, the red carpet is rolled out for the B-2. With an unmistakable silhouette and flying wing design, it’s easily one of the most recognized aircraft in the world. It has appeared in movies including “Independence Day,” “Armageddon,” “Iron Man 2,” “Cloverfield,” “Airplanes,” “Rampage” and, most recently, “Captain Marvel.” 6 – The Team Today Northrop Grumman continues to upgrade and enhance the B-2’s capabilities, and service every B-2 aircraft. From the extensive programmed depot maintenance that ranges from the complete restoration of the jet’s exterior surfaces to software engineering, testing and development. Our employees also lead vehicle engineering, logistics and product support for the aircraft. 7 – Dimensions The B-2 is 69 feet long, 17 feet high and has a wingspan of 172 feet, half the length of a football field. The B-2 can reach a high subsonic speed and can also reach an altitude of more 50,000 feet. 9 – Intercontinental Range The B-2 can travel 6,000 nautical miles without refueling and 10,000 nautical miles with only one refueling. It can reach any point in the world within hours. 10 – Payload A B-2 can carry a payload of 20 tons. Get to know your B vitamins: Meet vitamin B2, also called riboflavin. B2 is one of eight B-complex vitamins. These vitamins work together to change carbohydrates from foods into fuel for your body. Vitamin B2 also helps release energy from proteins.In other words, riboflavin takes your whole-wheat bagel and cream cheese and turns it into energy to get you through that next meeting (even if it could have been an email).What is riboflavin (vitamin B2)?“Riboflavin is an essential micronutrient that helps cells develop and work well,” says registered dietitian Kayla Kopp, RD, LD. “Healthy bacteria in your gut microbiome make small amounts of riboflavin. But your body needs more to function. That’s why it’s important to get enough of this B vitamin in your diet every day.”What does vitamin B2 do for my body?Your body needs vitamin B2 (riboflavin) to break down carbohydrates from foods. This process helps your cells get the energy they need to function.Studies suggest vitamin B2 also offers these four health benefits:1. Prevents migrainesResearchers believe there may be a link between riboflavin, mitochondrial cell function and migraines. Mitochondria are your body’s energy makers. Riboflavin may also ease stress and minimize nerve inflammation that contributes to migraines.In one study, people who took 400 milligrams of vitamin B2 every day for three months had fewer migraines each month than those who took a placebo. A different study found similar effects in children. Even better, the children saw a decrease in migraine pain for up to 18 months after they stopped taking riboflavin supplements.Based on findings like these, the American Academy of Neurology and the American Headache Society say people with chronic migraines may benefit from taking daily riboflavin supplements as a preventive measure.2. May lower your risk of cancerSome experts believe that riboflavin prevents cancer-causing substances called carcinogens from damaging cells. But research findings are mixed.A Women’s Health Initiative Observational Study found that participants who got more riboflavin in their diets had a lower risk of colorectal cancer. But other studies haven’t shown a link between the two.Another study investigated the effect of riboflavin on the risk of lung cancer in people who smoke. But the findings were inconclusive, and the researchers said the results needed more investigation.“If you’re at risk for certain cancers due to family history or other factors, talk to your healthcare provider to see if you should increase your intake of riboflavin,” advises Kopp. “And, of course, get the screenings and tests your provider recommends.”3. Protects your visionA diet rich in vitamin B2 and other B-complex vitamins may lower your risk of cataracts. These cloudy areas on your eye lenses cause vision problems, such as blurred or double vision. People with severe, prolonged vitamin B2 deficiency are most at risk for developing cataracts.4. Prevents anemiaRiboflavin helps your body absorb iron. Not getting enough riboflavin puts you at risk for iron-deficiency anemia.“People with anemia may feel extremely tired, look pale and bruise easily. They don’t have enough iron to make healthy red blood cells,” explains Kopp. “Red blood cells carry oxygen throughout your body.” Pregnant women and children are most at risk for anemia due to riboflavin deficiency.How much riboflavin (vitamin B2) do I need every day?The amount of riboflavin or vitamin B2 (measured in milligrams or mg) you need each day depends on your age, sex and whether you’re pregnant or breastfeeding.Source: National Institutes of HealthWhat foods have riboflavin (vitamin B2)?Meat and fortified products like cereal and bread are the main sources of riboflavin. You can also get vitamin B2 from:Almonds and other nuts.Beef, pork, chicken breast and organ meats.Dairy milk and products, such as yogurt and cheese.Eggs.Fish, such as salmon.Legumes.Vegetables, such as spinach.Mushrooms.Can you get too much riboflavin?Not really. There aren’t any known side effects or risks of getting too much riboflavin. “Riboflavin is a water-soluble vitamin, which means your body flushes out any extra amounts when you pee,” says Kopp. But a diet high in riboflavin can make the color of your pee bright yellow.Flavin is a variation of the Latin word “flavous,” which means yellow. The bright yellow shade might look alarming, but as Kopp notes, “This color is simply a sign that your body is getting rid of the vitamin it didn’t use and can’t store.”Do I need vitamin B2 supplements?Probably not. “I recommend eating lots of riboflavin-rich, healthy foods,” says Kopp. “But you could also take multivitamins that have B vitamins or B-complex supplements.” If you’re concerned about how much vitamin B2 you’re getting, your healthcare provider can order a blood test to check your riboflavin levels. If tests show you need more B2, head to the store and stock up on leafy greens, lean meats, dairy products and other riboflavin-rich foods. By Namith DP | June 24, 2025 The B-2 Spirit, America’s most advanced long-range stealth bomber, has played a critical role in U.S. military operations since 1989. This three-part article offers a comprehensive account of its development, combat missions across five continents, major accidents, and its evolving legacy as it transitions to the next-generation B-21 Raider. The B-2 Spirit is the U.S. Air Force’s premier long-range stealth bomber, designed for deep-penetration missions with both conventional and nuclear payloads. Since entering service in 1997, it has executed precision strikes in Kosovo, Iraq, Afghanistan, Libya, Yemen, and Iran—often undetected. Despite its high cost and limited fleet size, the B-2 remains a key pillar of U.S. strategic airpower. Origins & first flight: The U.S. Air Force launched the Advanced Technology Bomber program in the late 1970s. Northrop Grumman built the first prototype, which took its maiden flight on July 17, 1989, with operational service beginning in 1997. Production: Though initially planned at 132 aircraft, only 21 were produced due to cost overruns and geopolitical shifts; 19 remain operational today. First mission: On March 23, 1999, two B-2s flew nonstop from Missouri to Kosovo for Operation Allied Force. Effectiveness: Despite accounting for only 1% of sorties, B-2s delivered approximately 11% of NATO’s munitions, showcasing their strategic precision. Milestone: Demonstrated global reach with powerful payload delivery and minimal support footprint from home base. Longest combat mission: In October 2001, during Operation Enduring Freedom, a B-2 mission lasted a record 44 hours, with crews rotating rest and refueling. It dropped 16 bombs on Taliban and Al-Qaeda positions. Iraq War (2003): B-2s flew missions both from forward bases and Whiteman AFB, completing 49 sorties and deploying over 1.5 million pounds of munitions. Libya 2011: Under Operation Odyssey Dawn, B-2s dropped 40 bombs on Libyan air defense sites. Libya 2017: Returned to strike training camps, releasing approximately 180,500 pounds of JDAMs, command and intelligence supported by escort UAVs. Yemen (2024): B-2s launched Massive Ordnance Penetrator (MOP) strikes on Houthi targets from Australia, demonstrating global reach. First crash (Feb 23, 2008): The Spirit of Kansas (89-0127), crashed during takeoff at Andersen AFB, Guam. Both crew ejected safely; it was the only B-2 lost in combat or operation. Cause: moisture in air-data sensors led to faulty speed/angle readings; plane stalled and pitched up steeply. Loss estimated at US$1.4 billion, making it the costliest aircraft crash in U.S. history. Fleet was grounded for 53 days during safety review. A KC-10A Tanker from McGuire Air Force Base, New Jersey refuels the Northrop B-2 Stealth Bomber over the Midwestern U.S. on March 27, 2001. Photo by Gary Ell. Target: ISIS training camps near Sabha, southern Libya. Details: Two B-2s flew from Whiteman AFB and dropped 85–90 precision JDAMs on militant camps, guided by drone surveillance. Impact: U.S. AFRICOM confirmed over 80 enemy combatants killed. No civilian casualties were reported. Duration: 30-hour roundtrip including aerial refueling. Context: In response to multiple Houthi ballistic missile attacks on Red Sea shipping routes and U.S. assets in Djibouti. Strike details: B-2s launched GBU-57 Massive Ordnance Penetrators on underground weapons depots near Sa’dah. Significance: Demonstrated precision at range from a forward-deployed base in Darwin, Australia. Mission scope: Largest stealth strike in history against Iran’s nuclear facilities. Targets: Fordow Fuel Enrichment Plant, Natanz nuclear site, and Isfahan missile production complex. Sorties: 7 B-2s, 145 total U.S. aircraft, including F-22 escorts, tankers, and ISR platforms. Ordnance: 14 GBU-57/B MOPs dropped with pinpoint accuracy. Duration: 36–37 hours per aircraft, with up to three aerial refuelings. Outcome: Iranian IADS (Integrated Air Defense Systems) failed to intercept; global intelligence assessed >70% of Iran’s HEU production was disabled. First use of live Massive Ordnance Penetrators in combat. Demonstrated the B-2’s ability to penetrate a highly defended region undetected and return safely. Aircraft: “Spirit of Washington” Cause: Ground power unit short-circuited during a systems test at Whiteman AFB. Result: Damage estimated at $15 million; aircraft returned to service after 15 months. Aircraft: “Spirit of Missouri” Event: Skidded off a wet runway in Guam due to software malfunction during braking calibration. Outcome: Nose gear damage; aircraft repaired and returned to operational status in 2016. Aircraft: “Spirit of Alaska” Issue: Mid-air electrical system failure. Backup avionics remained functional. Protocol: Aircraft diverted and landed safely at RAF Fairford (UK). Incident led to a fleet-wide diagnostic audit of its Open Mission Systems (OMS). Two-pilot system: Mission commander and pilot. No navigator or electronic warfare officer (unlike B-52 or B-1). Roles: Pilot: flight controls, fuel management, takeoff/landing Commander: navigation, weapons delivery, tactical decisions Rest cycles: B-2s include a cot and portable microwave for missions exceeding 30 hours. Meals: No heavy food; preferred options include light sandwiches, trail mix, and electrolyte drinks. Physiological aids: Use of stimulants (“Go Pills”) in earlier years; now replaced with circadian-adjusted sleep scheduling and wearable alertness monitors. Most B-2 long-range missions require 2–3 refueling operations. Boom reception is conducted using heads-down instrument-only methods, requiring high skill under fatigue. Threat evolution: Nations like China and Russia have developed AESA radars (e.g., Nebo-M, Rezonans-NE) capable of low-frequency detection. B-2 response: Upgrades to the AN/APQ-181 radar in 2012 introduced AESA functionality with frequency-hopping to resist detection. Tactics: B-2s operate at high altitudes and avoid prolonged exposure in radar sweep zones. Missions use strict radio silence, precise timing, and support from jammers or SEAD assets. Open Mission Systems (OMS) installed in 2021 enable rapid integration of updated countermeasures. Cyber hardening: All B-2s received hardened networks post-2018 to defend against EW and satellite spoofing. RAM integrity: The B-2’s stealth relies heavily on radar-absorbent materials (RAM), which degrade in humidity or rain. Solution: By 2019, RAM technology had evolved to a more durable, field-replaceable formula reducing reapplication cycles by 40%. Consolidation: The B-2’s 1980s-era computers were replaced with modular digital avionics. OMS benefits: Software upgrades in weeks, not years Rapid integration of weapons like GBU-57, JASSM-ER, and possible hypersonic munitions Bomber Task Force missions: Since 2018, B-2s have participated in rotational deployments across Europe, the Pacific, and the Middle East. Forward bases: RAF Fairford (UK), Diego Garcia, and Andersen AFB (Guam) regularly host B-2 operations. Part of the nuclear triad, capable of delivering B61 and B83 gravity bombs. Critical for low-observable nuclear strike capability under START treaty limits. B-2’s high maintenance costs, limited fleet size, and 1980s design prompted the Air Force to pursue a stealth successor. The B-21 Raider, unveiled in 2022, is expected to: Cost under $750 million per unit Feature autonomous options Require less maintenance (40% less RAM upkeep projected) Initial operational capability (IOC): Expected by 2027. Fleet target: At least 100 aircraft under current Air Force planning. 1999–2025: over 150 operational sorties in six major combat theaters Total ordnance dropped: >5,000,000 pounds (estimated) Zero B-2s lost to enemy fire Development + procurement: ~$44 billion Strategic impact: Delivered disproportionate effects with minimal exposure Rewrote doctrines for stealth airpower Proved the viability of long-range precision strike Influenced development of next-gen platforms like the B-21 and even China’s H-20 Across its 36-year lifespan, the B-2 Spirit transformed global strike warfare. From Kosovo to Iran, it struck hardened targets across continents with precision and stealth. Though marred by operational cost and RAM upkeep, its combat record remains untarnished by enemy fire. As the B-21 Raider begins its ascent, the B-2 will be remembered not only as a symbol of Cold War-era innovation but as the stealth aircraft that proved it could reshape modern air combat for nearly four decades. 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