Vitamin B6 (pyridoxine)

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While some complementary and alternative techniques have been studied scientifically, high-quality data regarding safety, effectiveness, and mechanism of action are limited or controversial for most therapies. Whenever possible, it is recommended that practitioners be licensed by a recognized professional organization that adheres to clearly published standards. In addition, before starting a new technique or engaging a practitioner, it is recommended that patients speak with their primary healthcare provider(s). Potential benefits, risks (including financial costs), and alternatives should be carefully considered. The below monograph is designed to provide historical background and an overview of clinically-oriented research, and neither advocates for or against the use of a particular therapy.

Related Terms

• 2-Methyl-3-hydroxy-4,5-dihydroxymethylpyridine, 5-hydroxy-6-methyl-3,4-pyridinedimethanol [65-23-6], adermine hydrochloride, B complex vitamin, B6, B(6), Bio Zinc™, Beesix®, Benadon®, Bexivit, Hexobion®, Naturetime B6, pyridoxal, pyridoxal phosphate, pyridoxal-5-phosphate, pyridoxamine, pyridoxine, pyridoxine HCl, pyridoxine hydrochloride, pyroxin, rodex, vicotrat, vitabee 6, vitamin B-6.

Background

• Vitamin B6 (pyridoxine) is required for the synthesis of the neurotransmitters serotonin and norepinephrine and for myelin formation. Pyridoxine deficiency in adults principally affects the peripheral nerves, skin, mucous membranes, and the circulatory (blood cell) system. In children, the central nervous system (CNS) is also affected. Deficiency can occur in people with uremia, alcoholism, cirrhosis, hyperthyroidism, malabsorption syndromes, and congestive heart failure (CHF), and in those taking certain medications. Mild deficiency of vitamin B6 is common.

• Major sources of vitamin B6 include cereal grains, legumes, vegetables (carrots, spinach, peas, and potatoes), milk, cheese, eggs, fish, liver, meat, and flour. Pyridoxine is frequently used in combination with other B vitamins in vitamin B complex formulations.

• High homocysteine levels in the blood (hyperhomocysteinemia) have been suggested as being a risk factor for cardiovascular disease. Taking pyridoxine supplements in combination with other B vitamins (folic acid and vitamin B12) has been shown to be effective for lowering homocysteine levels. It is not clear if lowering homocysteine levels results in reduced cardiovascular morbidity and mortality.

• Vitamin B6 is also used to treat hereditary sideroblastic anemia, vitamin B6 deficiency, and vitamin B6-dependent seizures in newborns, and to prevent adverse effects in people taking the medication cycloserine. Evidence in support of other uses is inconclusive.

Scientific Evidence
Uses

These uses have been tested in humans or animals. Safety and effectiveness have not always been proven. Some of these conditions are potentially serious, and should be evaluated by a qualified healthcare provider.

**Hereditary sideroblastic anemia**
Hereditary sideroblastic anemia is an X-linked disorder that prevents normal red blood cell function. Pyridoxine supplements are effective for treating this condition under the supervision of a qualified healthcare provider.

**Preventing adverse effects in people taking cycloserine (Seromycin®)**
Cycloserine is a prescription antibiotic that may cause anemia, peripheral neuritis, or seizures by acting as a pyridoxine antagonist or increasing excretion of pyridoxine. Requirements for pyridoxine may be increased in patients receiving cycloserine. Pyridoxine may be recommended by a healthcare provider to prevent these adverse effects.

**Pyridoxine deficiency/neuritis**
Pyridoxine supplements are effective for preventing and treating pyridoxine deficiency and neuritis due to inadequate dietary intake, certain disease states, or deficiency induced by drugs such as isoniazid (INH) or penicillamine. Dietary supplements should be taken under the guidance of a qualified healthcare provider.

**Pyridoxine-dependent seizures in newborns**
Pyridoxine-dependent seizures in newborns can result from the use of high-dose pyridoxine in pregnant mothers or from autosomal recessive (genetic) pyridoxine dependency. Refractory seizures in newborns that are caused by pyridoxine dependence may be controlled quickly with intravenous administration of pyridoxine by a qualified healthcare provider.

**Premenstrual syndrome (PMS)**
There is some evidence that taking pyridoxine orally may improve symptoms of PMS such as mastalgia (breast pain or tenderness) and PMS-related depression or anxiety in some patients. Further research is needed before a conclusion can be made.

**Akathisia (movement disorder)**
Some prescription drugs called neuroleptics, which are used in certain psychiatric conditions, may cause movement disorders as an unwanted side effect. Vitamin B6 has been studied for the treatment of acute neuroleptic-induced akathisia (NIA) in schizophrenic and schizoaffective disorder patients. Preliminary results indicate that high doses of vitamin B6 may be useful additions to the available treatments for NIA, perhaps due to its combined effects on various neurotransmitter systems. Further research is needed to confirm these results.

**Alzheimer's disease prevention**
Hyperhomocysteinemia (high homocysteine levels in the blood) is a risk factor for Alzheimer's disease. Taking pyridoxine supplements alone or in combination with folic acid has been shown to be effective for lowering homocysteine levels. However, it is not clear if lowering homocysteine levels results in a reduced risk of Alzheimer's disease. Until definitive data are available, the current recommendation is screening of 40 year-old men and 50 year-old women for hyperhomocysteinemia. Further research is needed before a conclusion can be made.

**Angioplasty**
There are conflicting findings about the potential benefit or harm of taking folic acid plus vitamin B6 and vitamin B12 following angioplasty. Further research is needed before a strong recommendation can be made.

**Anxiety**
Studies of anxiety outcomes with vitamin B6 supplementation are limited. Well-designed clinical trials would be helpful in this area.

**Asthma**
Preliminary research suggests that children with severe asthma may have inadequate pyridoxine status. Theophylline, a prescription drug used to help manage asthma, seems to lower pyridoxine levels. Studies of pyridoxine supplementation in asthma patients taking theophylline have yielded inconclusive results. Further research is needed before a strong conclusion can be drawn.

**Attention deficit hyperactivity disorder (ADHD)**
Some research suggests that pyridoxine supplementation alone or in combination with other vitamins and minerals might help treat ADHD. Other studies show a lack of benefit. Further research is needed before a conclusion can be drawn.
Birth outcomes
Studies of birth outcomes with vitamin B6 supplementation during pregnancy have yielded mixed results. Further well-designed clinical trials might be helpful in this area.

Cancer prevention
There are data supporting the claim that vitamin B6 lowers the risk of colon cancer. Supplementation with a combination of folic acid, vitamin B6, and vitamin B12 did not decrease the risk of breast cancer. There is evidence that male smokers with higher serum levels of pyridoxine may have a lower risk of lung cancer. Well-designed clinical trials of pyridoxine supplementation are needed to confirm these results, and supplementation is not standard therapy at this time.

Cardiovascular disease / hyperhomocysteinemia
Hyperhomocysteinemia (high homocysteine levels in the blood) is a risk factor for cardiovascular disease, blood clotting abnormalities, atherosclerosis, myocardial infarction (heart attack), and ischemic stroke. Taking pyridoxine supplements alone or in combination with folic acid has been shown to be effective for lowering homocysteine levels. However, it is not clear if lowering homocysteine levels results in reduced cardiovascular morbidity and mortality. Until definitive data are available, the current recommendation is screening of 40 year-old men and 50 year-old women for hyperhomocysteinemia. Decreased pyridoxine concentrations are also associated with increased plasma levels of C-reactive protein (CRP). CRP is an indicator of inflammation that is associated with increased cardiovascular morbidity in epidemiologic studies. In a large, long-term study, a combination pill containing folic acid, vitamin B6, and vitamin B12 did not reduce the risk of cardiovascular disease in high-risk women. More high-quality studies are needed.

Carpal tunnel syndrome
Patients with carpal tunnel syndrome may have decreased vitamin B6 levels in their blood. Studies of pyridoxine supplementation in carpal tunnel syndrome have yielded inconclusive results. Well-designed clinical trials are needed before a firm conclusion can be drawn.

Cognitive function
Preliminary studies suggest an association between low blood folate and poor cognitive test performance. However, this was not shown with vitamin B6. Well-designed research is needed.

Depression
Preliminary evidence suggests that because pyridoxine increases serotonin and GABA levels in the blood, it may benefit people in dysphoric mental states. Increased homocysteine levels in the blood may increase the risk for later depression. Well-designed clinical trials are needed to confirm potential benefits.

Diabetes
Preliminary research suggests pyridoxine may improve glucose metabolism. Well-designed research is needed to confirm these results.

Dysmenorrhea (painful menstruation)
Preliminary research suggests pyridoxine may improve dysmenorrhea. Well-designed research is needed to confirm these results.

Hyperkinetic cerebral dysfunction syndrome
There is preliminary evidence that pyridoxine supplementation might benefit hyperkinetic children who have low levels of blood serotonin. Further research is needed to confirm these results.

Hypertension (high blood pressure)
Preliminary research suggests pyridoxine may reduce blood pressure in patients with high blood pressure. Well-designed research is needed to confirm these results.

Immune system function
Vitamin B6 is important for immune system function, such as for production of antibodies. One study found that the amount of vitamin B6 required to reverse immune system impairments in elderly people was more than the current recommended dietary allowance (RDA). Well-designed clinical trials on vitamin B6 supplementation for this indication are needed before a recommendation can be made.

Kidney stones (nephrolithiasis)
Pyridoxine alone, or taken with magnesium, may decrease urinary oxalate levels, which can contribute to a certain type of kidney stones. Higher pyridoxine intake has been associated with decreased risk of kidney stone formation in women but not in men with no history of stone formation. Benefit has not been proven in other types of kidney stones, such as those associated with high urinary calcium, phosphorus, and creatinine. Further data are needed before a firm conclusion can be drawn.
Lactation suppression
Studies of pyridoxine used to suppress lactation have yielded mixed results. Well-designed clinical trials are needed before a firm conclusion can be drawn.

McArdle’s disease
Vitamin B6 levels are low in the blood of many McArdle’s patients. Preliminary research suggests pyridoxine is unlikely to help with symptoms of McArdle’s disease. Well-designed research is needed to confirm these results.

Osteoporosis prevention
Studies of pyridoxine supplementation for osteoporosis prevention have yielded inconclusive results. Well-designed clinical trials are needed before a firm conclusion can be drawn.

Pain (breast)
Studies of breast pain outcomes with vitamin B6 supplementation are limited. Well-designed clinical trials would be helpful in this area.

Pregnancy-induced nausea and vomiting
Studies of the use of pyridoxine alone or in combination with other antinausea treatments in pregnant women have yielded conflicting results. Further research is needed before a strong recommendation can be made.

Preventing vitamin B6 deficiency associated with taking birth control pills
The need for vitamin B6 supplementation in women taking birth control pills has not been proven, although some studies have shown decreased pyridoxine levels in these women. Supplementation of B6 should be approached cautiously, since the long-term effect of such therapy is uncertain.

Seizures (febrile)
Preliminary research suggests pyridoxine is unlikely to help with symptoms of febrile seizures. Well-designed research is needed to confirm these results.

Tardive dyskinesia (involuntary movements)
Pyridoxine has some antioxidant effects, which theoretically may benefit patients with tardive dyskinesia. Results from a small high-quality trial suggest a benefit of vitamin B6 on symptoms of tardive dyskinesia. Further research is needed before a recommendation can be made.

Autism
Studies of B6 supplementation alone or in combination with magnesium have not been shown to definitively benefit autism. Further research is needed. Autism should be treated by a qualified healthcare provider.

Stroke reoccurrence
Pyridoxine alone or in combination with B12 and folic acid orally does not seem to be useful for preventing stroke recurrence. Further research is needed to determine the effect of vitamin B6 alone.

Tradition/Theory

The below uses are based on tradition, scientific theories, or limited research. They often have not been thoroughly tested in humans, and safety and effectiveness have not always been proven. Some of these conditions are potentially serious, and should be evaluated by a qualified healthcare provider. There may be other proposed uses that are not listed below.

• Acne, alcohol intoxication, allergies, antioxidant, appetite stimulation, arthritis, chorea (an involuntary movement disorder), conjunctivitis (pinkeye), cystitis, dementia, diabetic neuropathy, diuresis (increased urine production), dizziness, Down’s syndrome, epilepsy, high cholesterol, infertility, kidney failure, leg cramps (night leg cramps), menopausal symptoms, migraine headaches, motion sickness, muscle cramps, neural tube defects, Parkinson’s disease, poisoning (mushroom), psychosis, radiation sickness, sickle cell anemia, skin conditions, sleep enhancement (improving dream recall), Tourette’s syndrome.

Dosing

The below doses are based on scientific research, publications, traditional use, or expert opinion. Many herbs and supplements have not been thoroughly tested, and safety and effectiveness may not be
proven. Brands may be made differently, with variable ingredients, even within the same brand. The below doses may not apply to all products. You should read product labels, and discuss doses with a qualified healthcare provider before starting therapy.

**Adults (18 years and older)**

- Recommended dietary allowances (RDAs) of vitamin B6 by mouth daily are as follows: for males 19-50 years old, 1.3 milligrams; for males 51 years old and older, 1.7 milligrams; for females 19-50 years old, 1.3 milligrams; and for females 51 years old and older, 1.5 milligrams. Some researchers think the RDA should be increased to the following daily: for women 19-50 years old, 1.5-1.7 milligrams; for pregnant women, 1.9 milligrams; and for lactating women, two milligrams.
- Recommended maximum daily intake of vitamin B6 by mouth for adults, pregnant, and lactating women (over 18 years old) is 100 milligrams. A doctor and pharmacist should be consulted for dosing in other conditions.
- For anemia, 25 milligrams of vitamin B6 has been taken by mouth in combination with multivitamins from the second trimester to delivery in pregnant HIV-positive women.
- For anxiety, 50 milligrams of vitamin B6 has been taken by mouth in combination with magnesium daily.
- For birth outcomes, the following doses have been taken by mouth: 20 milligrams daily; three lozenges daily with 6.67 milligrams of pyridoxine in each lozenge; 2.6-20 milligrams of pyridoxine HCl daily; 25 milligrams of pyridoxine HCl daily; and a single dose of 100 milligrams.
- For carpal tunnel syndrome, 200 milligrams of vitamin B6 has been taken by mouth daily for 10-12 weeks.
- For cognitive function, 20 milligrams of vitamin B6 has been taken by mouth daily for 12 weeks.
- For dysmenorrhea, 200 milligrams of vitamin B6 has been taken by mouth daily.
- For gestational diabetes, 100 milligrams of vitamin B6 has been taken by mouth daily for 14 days.
- For high blood pressure, five milligrams of vitamin B6 per kilogram of body weight has been taken by mouth daily for four weeks.
- For McArdle's disease, 50 milligrams of vitamin B6 has been taken by mouth daily for 10 weeks, without evidence of benefit.
- For pregnancy-induced nausea and vomiting, the following doses have been taken by mouth: 25 milligrams of vitamin B6 every eight hours for 72 hours; 10 milligrams pyridoxine HCl every eight hours for five days; and 100 milligrams of vitamin B6 daily for seven days.
- For premenstrual syndrome, up to 600 milligrams has been taken by mouth; however, 100 milligrams daily has been suggested as the optimal level, due to the potential for side effects at higher doses.

**Children (under 18 years old)**

- The recommended dietary allowances (RDAs) of vitamin B6 (daily) are as follows: for infants 0-6 months old, 0.1 milligrams; for infants 7-12 months old, 0.3 milligrams; for children 1-3 years old, 0.5 milligrams; for children 4-8 years old, 0.6 milligrams; for children 9-13 years old, one milligram; for males 14-18 years old, one milligram; and for females 14-18 years old, 1.2 milligrams.
- The recommended maximum daily intakes of vitamin B6 are as follows: for children 1-3 years old, 30 milligrams; for children 4-8 years old, 40 milligrams; for children 9-13 years old, 60 milligrams; and for adult males and females, and pregnant and lactating females 14-18 years old, 80 milligrams.
- For hereditary sideroblastic anemia, 2-25 milligrams of vitamin B6, alone or in combination with iron or a multivitamin has been taken by mouth for up to eight weeks.

**Safety**
The U.S. Food and Drug Administration does not strictly regulate herbs and supplements. There is no guarantee of strength, purity or safety of products, and effects may vary. You should always read product labels. If you have a medical condition, or are taking other drugs, herbs, or supplements, you should speak with a qualified healthcare provider before starting a new therapy. Consult a healthcare provider immediately if you experience side effects.

Allergies

- Patients should avoid vitamin B6 products if they are sensitive or allergic to any of their ingredients.

Side Effects and Warnings

- Some individuals seem to be particularly sensitive to vitamin B6 and may have problems at lower doses. Overall, pyridoxine is generally considered safe in adults and children when used appropriately at recommended doses.
- Arrhythmia (abnormal heart rhythm), skin reactions (such as acne, allergic reactions, and photosensitivity), gastrointestinal effects (such as nausea, vomiting, abdominal pain, loss of appetite, a feeling of a lump in the throat, abdominal discomfort, heartburn, recurrence of ulcerative colitis (in patients with ulcerative colitis)), increased liver function test results (serum aspartate transaminase (AST, SGOT)), neurologic effects (such as headache, paresthesia (an abnormal physical sensation such as prickling, tingling or numbness), somnolence, sedation, and sensory neuropathy), breast soreness or enlargement, persistent bleeding, decreased serum folic acid levels, seizures after large doses, hypotonia (decreased muscle tone or strength), and respiratory distress in infants have been reported.
- Adverse reactions to preservatives in high-dose pyridoxine hydrochloride intravenous injections are possible.
- Vitamin B6 may lower blood pressure. Caution is advised in patients taking agents that lower blood pressure.
- Vitamin B6 may affect blood sugar levels. Caution is advised in patients with diabetes or hypoglycemia, and in those taking drugs, herbs, or supplements that affect blood sugar. Blood glucose levels may need to be monitored by a qualified healthcare professional, including a pharmacist. Medication adjustments may be necessary.
- Vitamin B6 may increase the risk of bleeding. Caution is advised in patients with bleeding disorders or those taking drugs that may increase the risk of bleeding. Dosing adjustments may be necessary.
- Use cautiously in patients with cardiovascular or gastrointestinal conditions.
- Use cautiously in patients taking agents for Parkinson's disease, as pyridoxine enhances the metabolism of levodopa, reducing its antiparkinsonism effects. However, the use of carbidopa and levodopa (Sinemet®) may avoid this interaction, as carbidopa can reduce pyridoxine levels.
- Avoid if allergic or hypersensitive to any ingredient in vitamin B6 products.
- Avoid excessive dosing (doses higher than 200 milligrams daily).
- Avoid high doses during pregnancy or lactation. A special sustained-release multi-ingredient product has been approved by the U.S. Food and Drug Administration (FDA) for use in pregnancy. However, it should not be used long-term, without medical supervision and close monitoring, or in more excessive doses. There is some concern that high-dose maternal pyridoxine can cause neonatal seizures.

Pregnancy and Breastfeeding

- Vitamin B6 is likely safe during pregnancy when used orally in doses not exceeding the recommended dietary allowance (RDA). Vitamin B6 is possibly safe when used orally and appropriately in amounts exceeding the recommended dietary allowance. A special sustained-
release multi-ingredient product has been approved by the U.S. Food and Drug Administration (FDA) for use in pregnancy. However, it should not be used long-term, without medical supervision and close monitoring, or in more excessive doses. There is some concern that high-dose maternal pyridoxine can cause neonatal seizures.

- Vitamin B6 is likely safe during lactation when used orally in doses not exceeding the RDA. There is insufficient reliable information about the safety of pyridoxine when used in higher doses in lactating women. Because most breastfeeding women do not consume the RDA of vitamin B6 in their normal diets and do not provide totally breastfed infants with the RDA of this vitamin, higher doses of vitamin B6 may be recommended, although benefits have not been well proven.

Interactions

Most herbs and supplements have not been thoroughly tested for interactions with other herbs, supplements, drugs, or foods. The interactions listed below are based on reports in scientific publications, laboratory experiments, or traditional use. You should always read product labels. If you have a medical condition, or are taking other drugs, herbs, or supplements, you should speak with a qualified healthcare provider before starting a new therapy.

Interactions with Drugs

- Preliminary research suggests that pyridoxine may exacerbate amiodarone (Cordarone®)-induced photosensitivity. Other research suggests a protective effect. Due to conflicting information, a firm conclusion cannot be drawn at this time, but monitoring may be warranted.
- Destruction of normal gastrointestinal flora by antibiotics can cause decreased production of the B vitamins. The clinical significance of this is unknown.
- Cycloserine is an antibiotic that may cause anemia or peripheral neuritis by acting as a pyridoxine antagonist or increasing renal excretion of pyridoxine. Requirements for pyridoxine may be increased in patients receiving cycloserine.
- Use of estrogens and estrogen-containing oral contraceptives can interfere with pyridoxine metabolism, reducing serum pyridoxine levels. The need for pyridoxine supplementation has not been adequately studied.
- Hydralazine (Apresoline®) may increase pyridoxine requirements. The need for pyridoxine supplementation has not been adequately studied.
- Isoniazid (INH, Rifamate®) may increase pyridoxine requirements.
- Pyridoxine enhances the metabolism of levodopa (Sinemet®), reducing its antiparkinsonism effects. Carbidopa and levodopa used together may avoid this interaction.
- Penicillamine (Cuprimine®, Depen®) may increase pyridoxine requirements.
- Preliminary data suggest that pyridoxine may reduce plasma levels of phenobarbital (Luminal®), possibly by increasing metabolism. Patients taking phenobarbital should avoid high doses of pyridoxine.
- Preliminary data suggest that pyridoxine may reduce plasma levels of phenytoin (Dilantin®), possibly by increasing metabolism. Patients taking phenytoin should avoid high doses of pyridoxine.
- Theophylline (Theo-Dur®), a medication used for asthma, interferes with pyridoxine metabolism. Study results of supplemental pyridoxine in these patients are inconclusive.
- Vitamin B6 may increase the risk of bleeding when taken with drugs that increase the risk of bleeding. Some examples include aspirin, anticoagulants (blood thinners) such as warfarin (Coumadin®) or heparin, antiplatelet drugs such as clopidogrel (Plavix®), and nonsteroidal anti-inflammatory drugs such as ibuprofen (Motrin®, Advil®) or naproxen (Naprosyn®, Aleve®).
- Vitamin B6 may affect blood sugar levels. Caution is advised when using medications that may also affect blood sugar. Patients taking insulin or drugs for diabetes by mouth should be monitored closely by a qualified healthcare professional, including a pharmacist. Medication adjustments may be necessary.
• Vitamin B6 may lower blood pressure. Caution is advised in patients taking agents that lower blood pressure.
• Vitamin B6 may also interact with agents used for the kidneys, antianxiety agents, anticancer agents, antidepressants, anti-Parkinson agents, bone agents, cognitive agents, furosemide, lactation stimulants, homocysteine-lowering agents, immune agents, neurologic agents, or photosensitizing agents.

Interactions with Herbs and Dietary Supplements

• Theoretically, herbs and supplements with estrogen-like activity may interact with pyridoxine.
• Destruction of normal gastrointestinal flora by antibiotics can cause decreased production of the B vitamins. The clinical significance of this is unknown.
• Vitamin B6 may lower blood pressure. Caution is advised in patients taking herbs or supplements that lower blood pressure.
• Vitamin B6 may affect blood sugar levels. Caution is advised when using herbs or supplements that may also affect blood sugar. Blood glucose levels may require monitoring, and doses may need adjustment.
• Vitamin B6 may increase the risk of bleeding when taken with herbs and supplements that are believed to increase the risk of bleeding. Multiple cases of bleeding have been reported with the use of Ginkgo biloba, and fewer cases with garlic and saw palmetto. Numerous other agents may theoretically increase the risk of bleeding, although this has not been proven in most cases.
• Vitamin B6 may also interact with agents used for the kidneys, antianxiety agents, antiasmatic agents, anticancer agents, antidepressants, bone agents, cognitive agents, homocysteine-lowering agents, immune agents, lactation stimulants, magnesium, neurologic agents, omega-3 fatty acids, anti-Parkinson agents, or photosensitizing agents.

Author Information

• This information is based on a systematic review of scientific literature edited and peer-reviewed by contributors to the Natural Standard Research Collaboration (www.naturalstandard.com).

References

Natural Standard developed the above evidence-based information based on a thorough systematic review of the available scientific articles. For comprehensive information about alternative and complementary therapies on the professional level, go to www.naturalstandard.com. Selected references are listed below.


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