Niacin (vitamin B3, nicotinic acid), Niacinamide

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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-pyridone, 3-pyridine carboxamide, acipimox (5-methylpyrazinecarboxylic acid 4-oxide), acipomox, Acipimox®, anti-blacktongue factor, antipellagra factor, B vitamin, B-complex vitamin, benicot, B-vitamin, chromium polynicotinate (niacin-bound chromium), coenzyme beta-nicotinamide adenine dinucleotide (NAD(+))), crystalline niacin, dihydropyridines, Efacin®, Endur-Acin® (sustained release niacin (nicotinic acid)), Enduramide®, ER niacin, esters of niacin, extended-release (ER) niacin, extended-release (ER) niacin monotherapy, extended-release (ER) niacin therapy, Hexopal®, immediate-release (crystalline) niacin, immediate-release niacin, inositol hexaniacinate, inositol hexanicotinate, inositol nicotinate, kynurenine (KYN), low-dose sustained-release nicotinic acid (Tri-B3), meso-inositol hexanicotinate, methyl nicinamide, Nature's Bounty® Flush Free Niacin Inositol Hexanicotinate 500mg Dietary Supplement, NIAC®, niacin, niacin (nicotinic acid), niacin equivalents, niacin ER, niacinamide, niacinamide adenine dinucleotide (NAD), niacinamide adenine dinucleotide phosphate (NADP), niacin/colestipol therapy, Niacor®, Niaspan® (prolonged-release nicotinic acid), Niaspan® (sustained-release nicotinic acid), Nicalex®, nicamid, Nicamin®, Nicangin®, Nicobid® (time-release niacin), Nicolar® (unmodified niacin), nicosadine, Nico-Span®, nicotinamide, nicotinamide (niacinamide), Nicotinamide cures, nicotinate, Nicotinex®, nicotinic acid, nicotinic acid adenine, nicotinic acid adenine dinucleotide phosphate (NAADP), nicotinic acid amide, nicotinic acid analog (low plasma free fatty acid trial, LFA), nicotinic acid analogue, nicotinic amide, nicotinuric acid, nicotylamidum, nutrient supplements, Papulex®, pellagra preventing factor, pentaerythritoltriacetinolate, perycit, prolonged-release (PR) nicotinic acid (niacine) [Niaspan®], pyridine-3-carboxylic acid, Slo-Niacin® (sustained-release niacin), sustained-release nicotinic acid (Nico-Span®), Tega-Span®, Tri-B3®, trigonelline, tryptophan, vitamin B-3, vitamin B3, vitamin B3 (nicotinamide), vitamin B3 derivative, vitamin-B complex (vit-B), Wampocap®, wax-matrix sustained release niacin, wax-matrix sustained-release niacin (Endur-Acin®).

Background

- Vitamin B3 is made up of niacin (nicotinic acid) and its amide, niacinamide, and can be found in many foods, including yeast, meat, fish, milk, eggs, green vegetables, and cereal grains. Dietary tryptophan is also converted to niacin in the body. Vitamin B3 is often found in combination with other B vitamins including thiamine, riboflavin, pantothenic acid, pyridoxine, cyanocobalamin, and folic acid.

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.*

<table>
<thead>
<tr>
<th>Grade</th>
<th>Condition</th>
<th>Details</th>
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<tbody>
<tr>
<td>A</td>
<td>High cholesterol (niacin)</td>
<td>Niacin is a well-accepted treatment for high cholesterol. Multiple studies show that niacin (not niacinamide) has significant benefits on levels of high-density cholesterol (HDL or &quot;good cholesterol&quot;), with better results than prescription drugs such as &quot;statins&quot; like atorvastatin (Lipitor®). There are also benefits on levels of low-density cholesterol (LDL or &quot;bad cholesterol&quot;), although these effects are less dramatic. Adding niacin to a second drug such as a statin may increase the effects on low-density lipoproteins. The use of niacin for the treatment of dyslipidemia associated with type 2 diabetes has been controversial because of the possibility of worsening glycemic control. Patients should check with a physician and pharmacist before starting niacin.</td>
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<tr>
<td>A</td>
<td>Pellagra (niacin)</td>
<td>Niacin (vitamin B3) and niacinamide are U.S. Food and Drug Administration (FDA)-approved for the treatment of niacin deficiency. Pellagra is a nutritional disease that develops due to insufficient dietary amounts of vitamin B3 or the chemical it is made from, tryptophan. Symptoms of pellagra include skin disease, diarrhea, dementia, and depression.</td>
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<td>B</td>
<td>Atherosclerosis (niacin)</td>
<td>Niacin decreases blood levels of cholesterol and lipoprotein (a), which may reduce the risk of atherosclerosis (&quot;hardening&quot; of the arteries). However, niacin also can increase homocysteine levels, which may have the opposite effect. Overall, the scientific evidence supports the use of niacin in combination with other drugs (but not alone) to decrease cholesterol and slow the process of atherosclerosis. More research is needed in this area before a firm conclusion can be drawn.</td>
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<tr>
<td>B</td>
<td>Prevention of a second heart attack (niacin)</td>
<td>Niacin decreases levels of cholesterol, lipoprotein (a), and fibrinogen, which can reduce the risk of heart disease. However, niacin also increases homocysteine levels, which can increase this risk. Numerous studies have looked at the effects of niacin, alone and in combination with other drugs, for the prevention of heart disease and fatal heart attacks. Overall, this research suggests benefits of niacin, especially when combined with other cholesterol-lowering drugs.</td>
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<tr>
<td>C</td>
<td>Age-related macular degeneration (AMD)</td>
<td>Niacin may benefit the choroidal blood vessels, which underlie the region of the retina called the macula. Age-related macular degeneration (AMD) may result from disrupted blood flow in the choroidal vessels. Studies suggest that niacin may be used to treat AMD, but more well-designed studies are needed.</td>
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<tr>
<td>C</td>
<td>Alzheimer's disease/ cognitive decline</td>
<td>Dementia can be caused by severe niacin insufficiency, but it is unclear whether variation in intake of niacin in the usual diet is linked to neurodegenerative decline or Alzheimer's disease (AD). Further research is needed before a conclusion can be drawn.</td>
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### Diabetes (Type 1/Type 2)
Niacinamide may prevent diabetes or delay the need for insulin. More research is needed to determine if niacinamide delays or prevents the onset of insulin dependence in individuals with type 1 diabetes. Niacin has been used to treat dyslipidemia associated with type 2 diabetes. However, this treatment has been controversial because it may worsen glycemic control. Patients should seek medical advice before starting niacin.

### Headaches
There is not enough information about the treatment or prevention of headaches with niacin. More research is needed.

### High blood phosphorous level (hyperphosphatemia)
Niacinamide may reduce the high serum phosphate levels in hyperphosphatemia. However, more research is needed before niacinamide can be used to treat hyperphosphatemia.

### Osteoarthritis (niacinamide)
Preliminary human studies suggest that niacinamide may be useful in the treatment of osteoarthritis. Further research is needed before a recommendation can be made.

### Skin conditions
Niacinamide has been used in skin care products, including moisturizers, anti-aging products, and rosacea treatments. The benefits of niacinamide in skin care needs to be further studied before recommendations are made.

### Type 1 diabetes mellitus prevention (niacinamide)
Niacinamide (not niacin) does not appear to delay the development of diabetes mellitus (type 1). Evidence is mixed and more study is needed in this area.

### 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.

- Alcohol dependence, anemia, angina, anti-aging, antioxidant, anxiety, arrhythmia, arthritis, Bell's palsy, bone marrow suppression, brain damage, breast cancer, bursitis, cancer prevention, cataract prevention, central nervous system disorders, chemotherapy-induced bone marrow suppression, cholera, cholelithiasis, chronic diarrhea/hypokalemia (related to pancreatic islet cell dysplasia), circulation improvement, confusion, coronary heart disease (CHD), cosmetic uses, deafness, dementia (confusion), depression, dermatitis, diagnostic test for schizophrenia, diarrhea, diabetic complications (lipid abnormalities), digestion improvement, dizziness, drug-induced hallucinations, encephalopathy, glossitis (inflammation of the tongue), growth, hearing loss, high blood pressure, HIV prevention, hyperactivity, hypothyroidism (reduced thyroid function), insomnia, ischemia-reperfusion injury prevention, itching, leprosy, liver cancer, liver disease, low blood sugar, lupus (lipid abnormalities), memory enhancement, Ménière's syndrome, motion sickness, multiple sclerosis, nutrition supplementation, obesity, orgasm improvement, pain, painful menstruation, pancreatitis, parasites, Parkinson's disease, peripheral vascular disease, photosensitivity, platelet aggregation inhibition, pregnancy problems, premenstrual headache prevention, premenstrual syndrome, prostate cancer, psoriasis, psychosis, Raynaud's phenomenon, scleroderma, sedative, seizure, sleep quality, smoking cessation, stroke, swelling, tardive dyskinesia, taste disturbances (diminished/distorted sense of taste), thyroid disease, tinnitus (ringing in the ears), tuberculosis, tumor detection, ulcers, vascular spasm, vertigo, wound healing.
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 (over 18 years old)

- Taking niacin with food may reduce stomach upset and the risk of stomach ulcers. Doses usually start low and are gradually increased to minimize the common side effect of skin flushing. Taking aspirin or non-steroidal anti-inflammatory drugs (NSAIDs) at the same time during the first one to two weeks may reduce this flushing. Use of an antihistamine 15 minutes prior to a niacin dose may also be helpful. The flushing response may decrease on its own after one to two weeks of therapy. Extended release niacin products may cause less flushing than immediate release (crystalline) formulations, but may have a higher risk of stomach upset or liver irritation. In general, not all niacin products are equivalent. Patients switching from one product to another may have an increase or decrease in side effects.

- The dietary reference intake established by the Food and Nutrition Board for niacin (in the form of niacin equivalents, 1 milligram niacin = 60 milligrams tryptophan) ranges from 14 to 18 milligrams daily for adults, with a maximum intake of 35 milligrams daily. 50 milligrams to 6 grams has been taken in divided doses for other conditions based on physician and pharmacist recommendations.

- Niacinamide (nicotinamide) and niacin (nicotinic acid) are used in cosmetics, as well as hair and skin conditioning agents. The concentration of niacinamide varies from a low of 0.0001% in night preparations to a high of 3% in body and hand creams, lotions, powders, and sprays. Niacin concentrations range from 0.01% in body and hand creams, lotions, powders, and sprays to 0.1% in paste masks (mud packs). For skin conditions, 2-5% niacinamide cream has been used.

- Niacin dosing may vary according to the condition it is being used to treat. In clinical studies, doses have included 500 milligrams (single dose) for age-related macular degeneration, 375 milligrams (single dose) for hyperphosphatemia, up to 1 gram daily for pellagra, up to 3 grams daily for diabetes, up to 3 grams daily for osteoarthritis, and up to 6 grams daily (either alone or combined with other agents) for cardiovascular disease.

Children (under 18 years old)

- There is not enough scientific evidence to recommend the safe use of niacin or niacinamide in children. Niacinamide has been studied in children at daily doses of approximately 150 to 300 milligrams per year of the child's age (up to 3 grams), or 20-40 milligrams per kilogram daily, for the prevention of type 1 diabetes mellitus in "high-risk" individuals. There is a lack of reported serious side effects, and safety and effectiveness are not clear. Patients should speak with a qualified healthcare provider if considering this therapy.

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

- Rarely, anaphylactic shock (severe allergic reaction) has been described after intravenous or oral niacin therapy.
Side Effects and Warnings

- Most people taking niacin experience skin flushing and a warm sensation, especially of the face, neck, and ears when they begin treatment or increase dose. This reaction is usually mild, but has been intolerable enough to cause up to half of participants in studies to stop therapy. Dry skin and itching is also commonly experienced. Taking aspirin or non-steroidal anti-inflammatory drugs such as ibuprofen (Advil®, Motrin®), naproxen (Naprosyn®), or indomethacin (Indocin®) can reduce the flushing. Use of an antihistamine 15 minutes prior to a niacin dose may also be helpful. Slow-release niacin products may have less skin flushing than regular release niacin preparations or may simply delay the appearance of flushing. The flushing response often decreases on its own after one to two weeks of therapy. Mild stomach upset, nausea, vomiting, and diarrhea also may occur when beginning niacin therapy; these symptoms usually resolve with continued use.

- More serious side effects include liver toxicity, worsening of stomach ulcers, and altered blood sugar or insulin levels or uric acid concentrations. Numerous case reports describe liver toxicity, including increased liver enzyme levels in the blood, skin yellowing (jaundice), fluid in the abdomen (ascites), or liver failure. Monitoring of liver blood tests while using niacin is recommended. While slow-release niacin products may have less skin flushing than regular release niacin preparations, they may worsen stomach and liver side effects. High doses of niacin may also cause low blood pressure.

- Lactic acidosis, muscle cell damage (myopathy), and increased blood levels of creatine kinase (a marker of muscle damage) have been reported in studies.

- Abnormal heart rhythms, heart palpitations, and circulatory collapse (when injected through the veins) have occurred following niacin use. Based on human research, taking niacin alone or with colestipol may increase blood homocysteine levels. High levels of homocysteine have been associated with an increased risk of heart disease.

- Blood clotting problems have been reported during treatment with sustained-release niacin. Low white blood cell number (leukopenia) and slightly increased blood eosinophils have also been reported.

- Rarely reported side effects include headache, dry eye, tooth or gum pain, dizziness, breathing difficulty, increased anxiety, panic attacks, rash, and decreased thyroid function (hypothyroidism). There are published accounts of temporary side effects of the eye including macular swelling and blurred vision as well as toxic amblyopia ("lazy eye"). These side effects resolved when niacin was stopped.

Pregnancy and Breastfeeding

- Use of niacin supplementation during pregnancy or breastfeeding is not recommended due to lack of sufficient research of safety and effectiveness.

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

- In theory, there may be an increased risk of liver damage if niacin is taken with alcohol or drugs that are toxic to the liver. Niacin-induced flushing may be increased by simultaneous use of alcohol and nicotine.

- Based on human study, use of niacin with cholesterol-lowering drugs, such as "statins" (HMG-CoA reductase inhibitors) including lovastatin (Mevacor®) or atorvastatin (Lipitor®), bile acid sequestrants like cholestyramine, probucol, or anti-lipid agents like gemfibrozil may result in further reductions in cholesterol than caused by either agent alone. However, bile acid sequestrants cholestyramine and colestipol may reduce niacin absorption into the body. Use of niacin with HMG-CoA reductase inhibitors
or gemfibrozil may increase the risk of serious side effects such as liver or muscle damage. Although not well studied in humans, niacin may also interact with procetofene, another cholesterol-lowering drug.

- Based on human study, niacin may increase blood sugar levels, and may require dosing adjustments of insulin or prescription diabetes drugs. Caution is advised when using medications that may affect blood sugar.

- Antibiotics can lead to decreased amounts of B vitamins in the body. Conversely, based on animal study, pyrazinamide may increase niacin levels. Use of niacin with neomycin may add to the cholesterol-lowering effects of niacin. Based on laboratory study, niacinamide may interact with the antifungal drug griseofulvin (increases its solubility), with possible effects on its activity.

- In theory, niacin therapy may increase the risk of bleeding. There are published case reports of patients who developed reversible abnormal blood clotting (coagulopathy) conditions while taking sustained-release niacin. In addition, low blood platelet number (thrombocytopenia) has been observed in studies of niacin therapy. Some examples of drugs that may increase the risk of bleeding if taken with niacin include aspirin and anticoagulants ("blood thinners") such as warfarin (Coumadin®).

- Based on animal research, use of niacinamide with seizure medications like diazepam (Valium®), carbamazepine (Tegretol®), or sodium valproate (Depakote®) may increase their anti-seizure action. In laboratory studies, niacinamide has interacted with diazepam (increases its solubility) with uncertain overall effects. If taken with blood pressure-lowering drugs, niacinamide may cause a greater lowering of blood pressure. Niacin may interact with ganglionic blocking agents and increase the risk of lightheadedness and low blood pressure in some people when they stand up.

- Based on human study, niacin may alter thyroid hormones and require dosing adjustment of thyroid medications. Based on laboratory research, niacinamide may interact with testosterone, estrogen, or progesterone. Use of birth control pills may increase the amount of niacin produced in the body, thus lowering the doses of niacin needed for treatment.

- Because niacin may alter blood flow in age-related macular degeneration (AMD), patients using drugs or supplements to treat AMD should use niacin cautiously. Niacin may interact with agents that cause the veins in the body to dilate or enlarge.

- Niacin may interact with certain agents that are broken down in the liver by the cytochrome P450 system. Check with a pharmacist for a complete list of possible interactions.

**Interactions with Herbs and Dietary Supplements**

- In theory, use of niacin or niacinamide with herbs or supplements that have potential to cause liver injury may cause greater risk of liver toxicity.

- Use of aspirin has been shown to reduce the tingling, itching, flushing, and warmth associated with oral niacin administration, an effect which may also result from the use of possible salicylate-containing herbs like black cohosh, meadowsweet, poplar, sweet birch, willow bark, and wintergreen. However, levels of salicylates in herbs may vary or be too low to have this desired effect.

- Niacin may add to the effects of herbs that may lower blood cholesterol levels, including fish oil, garlic, or guggul. Based on human study, taking such combinations as chromium polynicotinate (niacin-bound chromium) with grape seed proanthocyanidin, or niacin with β-sitosterol and dihydro-β-sitosterol, may result in greater improvements in cholesterol than either agent alone.

- Antioxidants may reduce niacin's beneficial effects on cholesterol levels and heart disease, possibly by interfering with niacin's effects on high-density cholesterol (HDL). Recent research suggests that the addition of antioxidants to a combination of niacin plus simvastatin (Zocor®) reduced the benefit of niacin on heart blood vessel plaques, suggesting possible interference by antioxidants. In other research, use of niacin with vitamin A and vitamin E had greater effects on cholesterol levels than niacin alone. Vitamin E in combination with colestipol and niacin has also been associated with greater benefits on heart blood vessel plaques. This remains an area of controversy.

- Based on human study, niacin may increase blood sugar levels and may require dosing adjustments of hypoglycemic agents. In children, use of niacinamide and insulin together has been shown to lead to a
reduction in insulin dosage in patients with type 1 diabetes mellitus. Caution is advised when using herbs or supplements that may affect blood sugar.

- In theory, niacin therapy may increase the risk of bleeding when taken with herbs and supplements that are believed to increase the risk of bleeding. There are published case reports of patients who developed reversible abnormal blood clotting (coagulopathy) conditions while taking sustained-release niacin. In addition, low blood platelet number (thrombocytopenia) has been observed in studies of niacin therapy. Multiple cases of bleeding have been reported with the use of Ginkgo biloba, and fewer cases with garlic or saw palmetto.

- Based on laboratory study, niacinamide may interact with herbs or supplements with estrogen-like properties, and theoretically may increase the amount of niacin produced in the body (thus lowering the doses of niacin needed for treatment).

- Based on human study, niacin may interact with thyroid-active herbs or supplements such as bladderwrack, and alter thyroid hormone blood tests. Preliminary human research reports that zinc sulfate increases the amount of niacin breakdown products in the urine, suggesting a possible interaction between the two agents.

- Because niacin may alter blood flow in age-related macular degeneration (AMD), patients using herbs or supplements to treat AMD should use niacin cautiously. Niacin may interact with herbs or supplements that cause the veins in the body to dilate or enlarge.

- Niacin may interact with certain agents that are broken down in the liver by the cytochrome P450 system. Check with a pharmacist for a complete list of possible interactions.

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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