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They report that for each 100 mg per day increase in magnesium, the risk of stroke reduced by 2%.The ODS call for a “large, well-designed” investigation to understand the role of magnesium in heart health and the prevention of cardiovascular disease.Magnesium therapy may help prevent or relieve headaches. This is because a magnesium deficiency can affect neurotransmitters and restrict blood vessel constriction, which are factors doctors link to migraine.People who experience migraines may have lower levels of magnesium in their blood and body tissues compared with others. Magnesium levels in a person’s brain may be low during a migraine.A systematic review from 2017 states that magnesium therapy may be useful for preventing migraine. The authors suggest that taking 600 mg of magnesium citrate appears to be a safe and effective prevention strategy.The American Migraine Foundation report that people frequently use doses of 400–500 mg per day for migraine prevention.The amounts that may have an affect are likely to be high, and people should only use this therapy under the guidance of their doctor.Read more about magnesium for migraine.Magnesium may also play a role in premenstrual syndrome (PMS).Small-scale studies, including a 2012 article, suggest that taking magnesium supplements along with vitamin B-6 can improve PMS symptoms. However, a more recent 2019 review reports that the research is mixed, and further studies are needed.Magnesium levels may play a role in mood disorders, including depression and anxiety.According to a systematic review from 2017, low magnesium levels may have links with higher levels of anxiety. This is partly due to activity in the hypothalamic-pituitary-adrenal (HPA) axis, which is a set of three glands that control a person’s reaction to stress.However, the review points out that the quality of evidence is poor, and that researchers need to do high quality studies to find out how well magnesium supplements might work for reducing anxiety.The following table shows the recommended daily allowance (RDA) for magnesium intake by age and sex, according to the ODS.AgeMaleFemale1–3 years80 mg80 mg4–8 years130 mg130 mg9–13 years240 mg240 mg14–18 years410 mg360 mg19–30 years400 mg310 mg31–50 years420 mg320 mg51+ years420 mg320 mgPeople should increase their magnesium intake by around 40 mg per day during pregnancy.Experts base the adequate intake for babies under 1 year old on the amounts found in breastmilk.Many foods contain high levels of magnesium, including nuts and seeds, dark green vegetables, whole grains, and legumes. Manufacturers also add magnesium to some breakfast cereals and other fortified foods.The best sources of magnesium include:SourcePer servingPercentage of daily valueAlmonds (1 ounces or oz)80 mg20%Spinach (half a cup)78 mg20%Roasted cashews (1 oz)74 mg19%Oil roasted peanuts (one-quarter cup)63 mg16%Soy milk (1 cup)61 mg15%Cooked black beans (half a cup)60 mg15%Cooked edamame beans (half a cup)50 mg13%Peanut butter (2 tablespoons)49 mg12%Whole wheat bread (2 slices)46 mg12%Avocado (1 cup)44 mg11%Potato with skin (3.5 oz)43 mg11%Cooked brown rice (half a cup)42 mg11%Low fat yogurt (8 oz)42 mg11%Fortified breakfast cereals40 mg10%Oatmeal, instant, 1 packet36 mg9%Canned kidney beans (half a cup)35 mg9%Banana (1 medium)32 mg8%Wheat products lose magnesium when the wheat is refined, so it is best to choose cereals and bread products made with whole grains. Most common fruits, meat, and fish contain low in magnesium.Read more about 10 healthful high magnesium foods here.While many people do not meet their recommended intake for magnesium, deficiency symptoms are rare in otherwise healthy people. Magnesium deficiency is known as hypomagnesemia.Magnesium inadequacy or deficiency can result from excess consumption of alcohol, a side effect of certain medications, and some health conditions, including gastrointestinal disorder and diabetes. Deficiency is more common in older adults.Symptoms of magnesium deficiency include:a loss of appetitenausea or vomitingfatigue or weaknessSymptoms of more advanced magnesium deficiency include:muscle crampsnumbnesstinglingseizurespersonality changesheart rhythm changes or spasmsResearch has linked magnesium deficiency with a range of health conditions, including Alzheimer’s disease, type 2 diabetes, cardiovascular disease, and migraine.An overdose of magnesium through dietary sources is unlikely because the body will eliminate any excess magnesium from food through urine.However, a high intake of magnesium from supplements can lead to gastrointestinal problems, such as diarrhea, nausea, or cramping.Very large doses can cause kidney problems, low blood pressure, urine retention, nausea and vomiting, depression, lethargy, a loss of central nervous system (CNS) control, cardiac arrest, and possibly death.People with a kidney disorder should not take magnesium supplements unless their doctor advises that they do so.Magnesium supplementation may also give rise to some drug interactions. Medications that may interact with magnesium supplements or affect magnesium levels include:oral bisphosphonates that treat osteoporosis, such as alendronate (Fosamax)tetracycline antibiotics, including doxycycline (Vibramycin) and demeclocycline (Declomycin)quinolone antibiotics, including levofloxacin (Levaquin) and ciprofloxacin (Cipro)diuretics, such as furosemide (Lasix)prescription proton pump inhibitors, including esomeprazole magnesium (Nexium)Magnesium supplements are available to purchase online, but it is best to obtain any vitamin or mineral through food because nutrients work better when people combine them with other nutrients.Many vitamins, minerals, and phytonutrients work synergistically. This term means that taking them together brings more health benefits than taking them separately.It is better to focus on a healthful, balanced diet to meet daily requirements for magnesium and to use supplements as a backup, but under medical supervision.Magnesium is an essential macronutrient that plays a key role in many body processes, including muscle, nerve, and bone health, and mood.Research has linked magnesium deficiencies with a range of health complications. If a person is unable to get their daily requirements from their diet, a doctor may recommend taking magnesium supplements.Medical News Today has strict sourcing guidelines and relies on peer-reviewed studies, academic research institutions, and medical journals and associations. We only use quality, credible sources to ensure content accuracy and integrity. You can learn more about how we ensure our content is accurate and current by reading our editorial policy.Barbagallo, M., & Dominguez, L. J. (2015). 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A systematic review [Abstract]. B., et al. (2019). The effect of magnesium intake on stroke incidence: A systematic review and meta-analysis with trial sequential analysis. If there was an award given for “best supporting mineral” in your body, the Oscar could easily go to magnesium. It helps support more than 300 different chemical processes throughout your body.But what exactly does it do and how much do you need? Registered dietitian Kate Patton, RD, LD, shares some of magnesium’s most notable benefits.What is magnesium?Magnesium is a powerhouse mineral that plays a crucial role in various processes all across your body. It helps with everything from regulating blood pressure and blood sugar levels to promoting energy production, nerve function bone health.“Magnesium is an essential mineral that plays a lot of important background roles in our physiological functioning,” Patton says.In foods you eat, magnesium is versatile. It goes about its work all over your body. In supplements, magnesium is combined with other substances to help bring out specific benefits.For example:Magnesium glycinate is used in products to help promote sleep.Magnesium citrate is a powerful laxative.Magnesium oxide is sold as an antacid and migraine relief aid.Magnesium sulfate (Epsom salt) is known as a muscle relaxant.Magnesium benefitsWhile some vitamins and minerals get a reputation for being really good at one thing — say, vitamin C for immune health or calcium for strong bones — magnesium is more of a team player. It’s working behind the scenes to keep all of your systems working in tip-top shape.Patton shares just a few of magnesium’s best-known benefits.Helps muscle functionIf you’ve ever tried an Epsom salt bath, you may already know a bit about what may be magnesium’s most famous benefit. Some people say that soaking in a bathtub of Epson salt helps relieve sore muscles. The idea is that the magnesium in the salts absorbs into your skin to relieve aches and pains.Research doesn’t necessarily back that up (though it could still be worth a try). But what has been well established is that magnesium can help keep your muscles functioning at their best. What’s more, severe magnesium deficiency can cause muscle cramps, numbness and tingling.Aids digestionMagnesium has a hand in helping break down food in your body so it can properly get through your system. That’s why you may see magnesium in some products for treating things like heartburn and indigestion.Promotes heart healthMagnesium helps keep your heart healthy in a few ways.It can help keep your blood pressure in a healthy range. It can also help regulate your blood sugar, which helps protect you from diabetes. And it may even be beneficial for managing an abnormal heart rhythm.“Magnesium is an electrolyte, like sodium and potassium,” Patton explains. “That means it can help keep your body’s electrical system firing correctly.”Too little magnesium and your heartbeat can go off beat, resulting in heart palpitations.Relieves tension and anxietyMagnesium’s role in helping you relax is what gave rise to the “sleepy girl mocktail” trend. But you don’t have to mix up a special concoction to get magnesium’s stress-reducing benefits.Some researchers have found that magnesium may help level out cortisol levels. That means it can help keep your stress hormones from running amuck, which can lead to things like depression and anxiety.How much magnesium you need per dayYour magnesium needs change over the course of your lifetime. Starting in their teenage years, men need more magnesium than women. See these recommended dietary allowances (RDAs) for each age and sex:Babies 6 months and younger: 30 milligrams (mg)7 to 12 months: 75 mg1 to 3 years: 80 mg4 to 8 years: 130 mg9 to 13 years: 240 mg14 to 18 years male: 410 mg14 to 18 years female: 360 mg19 to 30 years male: 400 mg19 to 30 years female: 310 mg31 and older male: 420 mg31 and older female: 320 mgPregnant women should get an additional 40 mg of magnesium per day. Some, but not all, prenatal vitamins include magnesium. Check labels to know if yours does.Can you get too much?Magnesium can do your body good, but too much of a good thing can cause problems, especially when you’re taking supplements.Excessive magnesium intake can come with some risks, like:DiarrheaNauseaAbdominal crampingVery low blood pressureLethargyImpaired kidney functionWeaknessMost people can get all the magnesium they need through a healthy diet. Foods high in magnesium include nuts, seeds, greens, beans, fruits and grains. So, it’s not hard to come by.“A balanced diet that includes a variety of whole, plant-based foods should give most people the magnesium they need to stay healthy,” Patton shares. “You’re not going to eat too much magnesium to cause yourself any side effects. But when you’re taking supplements, it’s easy to go overboard.”People who have certain gastrointestinal issues that affect how well they absorb nutrients can be at higher risk for magnesium deficiency and may be advised to take supplements. Others are simply drawn to magnesium supplements to help with things like muscle aches or stress relief.If you think you would benefit from taking a magnesium supplement, talk with a healthcare provider first, like a dietitian or primary care physician. They can help make sure you’re taking the right amount in the right form to reap the benefits without the risks. Magnesium is a mineral that's crucial for the body's functions. What does magnesium do for the body?Magnesium helps keep blood pressure normal, bones strong, and the heart rhythm steady. It also controls your blood sugar levels and makes protein and DNA.Magnesium deficiencyWhen you don't get enough magnesium over time, you can end up with a deficiency. You may not feel it right away because your body tries to hold on to what little magnesium it has in your pee. Some illnesses and medicines can also mess with how your body handles magnesium, making deficiency more likely. Signs of a magnesium deficiency include:Not feeling hungryFeeling sickThrowing upBeing tiredFeeling weakIf you're really low on magnesium, you might feel numb and tingly, get muscle cramps, have seizures, or changes to your heart rhythm. Some people are more likely to have a magnesium deficiency. They include:People with gut problems such as Crohn's or celiac diseasePeople with type 2 diabetesPeople who misuse alcohol over a long periodOlder adultsPeople who have parathyroid problemsPeople who take certain drugs for diabetes and cancerPeople with kidney disease Health care providers sometimes suggest that people with these conditions take magnesium supplements.Proton pump inhibitors (PPIs), a common type of medicine used to treat acid reflux, are also linked to low magnesium levels. Examples of PPIs include:Dexlansoprazole (Dexilant)Esomeprazole (Nexium)Lansoprazole (Prevacid)Omeprazole (Prilosec, Zegerid)Pantoprazole (Protonix)Rabeprazole (Aciphex)If you take any of these medicines for a long time, your health care provider may perform a blood test to check your magnesium level.Experts say that many people in the U.S. aren't eating enough foods with magnesium. Adults who get less than the recommended amount of magnesium are more likely to have high levels of inflammation markers. Inflammation has been associated with major health conditions such as heart disease, diabetes, and certain cancers. Also, low magnesium appears to be a risk factor for osteoporosis.There's some evidence that eating foods high in magnesium and other minerals can help prevent high blood pressure in people with prehypertension. Doctors prescribe intravenous or injected magnesium to treat other conditions, such as eclampsia during pregnancy and severe asthma attacks. Magnesium is also the main ingredient in many antacids and laxatives.Magnesium for anxietyResearch shows magnesium could help you handle stress better and keep your cortisol levels in check. When your body doesn't have enough magnesium, stress can hit you harder. And when you're under a lot of physical or mental pressure, your magnesium levels can drop. The mineral may also calm your brain's chemical messengers, helping you feel more relaxed and ease muscle tension and cramps.Magnesium for migrainesResearchers have found that magnesium deficiency could play a role in migraine attacks. They're looking at whether magnesium supplements or IV treatments could ease symptoms.Magnesium and sleepMagnesium might improve sleep by controlling a brain chemical called GABA, which is crucial for sleep. It can also help relax muscles and regulate your nervous system, which could mean you'll sleep better at night.Does magnesium help you lose weight?Magnesium supplements have shown promise in lowering body mass index (BMI), especially in people with magnesium deficiency and obesity. This indicates that the mineral may help reduce overall body fat.The recommended dietary allowance (RDA) includes the magnesium you get from both the food you eat and any supplements you take.CategoryRecommended Dietary Allowance (RDA)CHILDREN1-3 years80 milligrams/day4-8 years130 milligrams/day9-13 years240 milligrams/dayFEMALES14-18 years360 milligrams/day19-30 years310 milligrams/day31 years and over320 milligrams/dayPregnantUnder 19 years: 400 milligrams/day19 to 30 years: 350 milligrams/day31 years and up: 360 milligrams/dayBreastfeedingUnder 19 years: 360 milligrams/day19 to 30 years: 310 milligrams/day31 years and up: 320 milligrams/dayMALES14-18 years410 milligrams/day19-30 years400 milligrams/day31 years and up420 milligrams/dayRecommended magnesium intake for children1-3 years: 80 milligrams/day4-8 years: 130 milligrams/day9-13 years: 240 milligrams/day14-18 years: 360 milligrams/day Recommended magnesium intake during pregnancyUnder 19 years: 400 milligrams/day19-30 years: 350 milligrams/day31 years and up: 360 milligrams/day Recommended magnesium intake while breastfeedingUnder 19 years: 360 milligrams/day19-30 years: 310 milligrams/day31 years and up: 320 milligrams/dayMost people get more than enough magnesium from foods and do not need to take magnesium supplements, as too much of the mineral can be toxic. In addition to what you get from food, the highest dose you should take of magnesium supplements is:65 milligrams/day for children aged 1-3110 milligrams/day for children aged 4-8350 milligrams/day for adults and children aged 9 or olderThese doses are the highest anyone should add to their diet. Many people take in significant quantities of magnesium through the foods they eat. It's safe to get high levels of magnesium naturally from food, but adding large amounts of supplements to your diet can prove dangerous. Do not exceed these maximum advised levels.Natural food sources of magnesium include:Green, leafy vegetables such as spinachNutsSeedsBeans, peas, and soybeansWhole-grain cerealsWheat germWheatOat branEating whole foods is always best. Magnesium can be lost during refinement and processing.Taking magnesium may cause side effects and other problems. Here's a closer look at some of them:Magnesium side effectsMagnesium supplements can cause nausea, cramps, and diarrhea. Magnesium supplements often cause softening of stool.Magnesium interactionsMagnesium supplements may interact with certain medicines, including diuretics, heart medicines, or antibiotics. If you take any medicine, check with your health care provider before taking magnesium.Conditions with extra risk factorsPeople with diabetes, intestinal disease, heart disease, or kidney disease should not take magnesium before speaking with their health care provider.Magnesium overdoseSigns of a magnesium overdose can include nausea, diarrhea, low blood pressure, muscle weakness, and fatigue. At very high doses, magnesium can be fatal.Magnesium is a mineral vital for normal blood pressure, strong bones, and steady heart rhythms. Many Americans don't get enough magnesium in their diets, which can lead to health issues such as inflammation, osteoporosis, and high blood pressure. While doctors suggest magnesium supplements for people with certain health conditions or taking specific medications, too much of the mineral can be harmful. Natural sources of magnesium include green leafy vegetables, nuts, beans, and whole-grain cereals. It’s been dubbed the ‘mineral of the moment’, with thousands of social media posts using the hashtag #magnesium since the start of the year. But how important is it for your health? And how can you make sure you’re getting enough?By Jessica BradleyLeafy green vegetables are a good source of magnesium because it is found in chlorophyll, which is the green pigment in plants. Unrefined grains, nuts and seeds are also good sources, as well as some fish, especially mackerel. Meats and milk also contain some levels of magnesium, but not as high.One analysis shows high levels of magnesium can be found in Brazil nuts, oat bran, brown medium grain rice, cashews, mackerel, spinach, almonds and Swiss chard. Another study says chia seeds and pumpkin seeds are also extremely magnesium-rich.You’re probably reaching the recommended daily amount if you’re eating a daily portion of unsalted nuts or wholegrains and eat a variety of fruit, green vegetables and legumes, says Rebecca McManamon, consultant dietitian and British Dietetic Association spokesperson.“If these are not foods you eat regularly, you may be at a higher risk of not getting enough magnesium,” she says.Related storiesWith chia seeds, wholegrain oats and nuts, this delicious breakfast dish, figgy date and nut oats, is rich in magnesium Magnesium may play a role in improving symptoms of anxiety and mild to moderate depression, according to research.“Magnesium has a critical role in the regulation of a central receptor known to be involved in mental health (stress, anxiety, mood/depression),” says Dye.“Several reviews have shown a potential interest in magnesium supplementation in these conditions.”Dye found, in her own review of evidence looking at the relationship between magnesium and mental health, that four out of eight studies showed positive effects on anxiety. However, the general quality of existing evidence is poor and she says well-designed trials are needed to further confirm the benefits of magnesium supplementation.SleepThere are many ways our eating habits can affect our sleep – and magnesium may be one part of the puzzle. One 2022 review of studies concluded there’s evidence to suggest getting enough magnesium is related to better sleep quality – but this effect has been found in population studies, which can’t fully separate cause from effect.Metabolic syndromeMetabolic syndrome refers to a group of health problems that increase your risk of developing type 2 diabetes or conditions affecting your heart. One analysis of more than 9,000 men found those with the highest intake of magnesium were a third less at risk of metabolic syndrome than those who had the lowest intake.Heart healthThere’s some evidence to suggest maintaining a good level of magnesium has heart benefits. One review of evidence, for example, found those with higher intakes of magnesium had an 8% lower chance of developing high blood pressure than those with the lowest intakes.An analysis of 90,000 female nurses over almost 30 years revealed those with the highest intake of magnesium had a 39% lower risk of having a heart attack compared to those with the lowest.Another review of evidence found getting enough magnesium can lower the risk of developing heart disease.Magnesium has also been found to have benefits for our bone health. Numerous population studies have found links between magnesium intake and bone mineral density, since magnesium is involved in bone formation.Magnesium deficiency is often very difficult to detect, says Louise Dye, professor of nutrition and behaviour in the University of Leeds.Surveys conducted in different countries have consistently shown the general population has a substantial inadequate intake of magnesium from food - particularly young adults, those over 70 years old and women - partly because of changes in farming practices and the western diet, Dye says.“Over the past 60 years, intensive farming practices have caused a significant depletion of the mineral content of the soil, including a decrease in magnesium of up to 30%,” she says.“Additionally, western diets typically have a greater proportion of processed food, where numerous products are mostly refined, with magnesium being depleted by up to 80–90% in the process.“Factors and behaviours associated with the western lifestyle, including intense sport and physical activity, poor sleep quality and quantity and psychological stress, can also induce magnesium loss.” she says.Magnesium deficiency is linked to health conditions, including gastrointestinal diseases, type 2 diabetes, alcohol dependence, kidney failure and genetic disorders.This is partly because magnesium deficiency contributes to a lower-level inflammation in the body, which is a common denominator among many diseases.Most of the research studying the link between magnesium intake and health benefits involves supplements, rather than magnesium intake through food.However, Dye says, magnesium supplements shouldn’t be used in place of diet and it shouldn’t be seen as a ‘miracle’ molecule capable of solving everything. If you have concerns about your health, you should visit your doctor, rather than just turn to vitamins or minerals.Consuming more than 400mg magnesium per day could cause diarrhoea says the NHS.If you don’t want to rely on supplements it’s easy to make sure you’re getting enough magnesium in your diet, experts say. And aiming to get enough magnesium through your diet will also bring about many more health benefits, since it’s found in whole foods.Nuts and seeds are the highest sources of magnesium per portion and a lot of other everyday foods will help too, says McManamon.“Having a handful of nuts a day is a great idea for not just magnesium, but to give us fibre, protein and healthy fats and some nuts give additional selenium and zinc,” she says.With tinned black beans and plenty of veg, this loaded sweet potato dish is nutrient-rich“Tinned black beans are a budget- and store cupboard-friendly source of magnesium and can go in meals like soups, curries, chilli and tacos, while giving us fibre, protein and polyphenols.“Getting a rainbow of fruit and vegetables, especially green leafy veg like spinach will help towards your magnesium intake too,” McMannon finishes.Magnesium-rich recipesOriginally published April 2024 This article is about the chemical element. For the use of magnesium as a medication, see Magnesium (medical use). Not to be confused with manganese (Mn). Chemical element with atomic number 12 (Mg)Magnesium, 12MgMagnesiumPronunciation/mæɡˈniːziəm/ (mag-NEE-zee-əm)Appearanceshiny grey solidStandard atomic weight Ar°(Mg)[24.304, 24.307][1]24.305±0.002 (abridged)[2] Magnesium in the periodic table Hydrogen Helium Lithium Beryllium Boron Carbon Nitrogen Oxygen Fluorine Neon Sodium Magnesium Aluminium Silicon Phosphorus Sulfur Chlorine Argon Potassium Calcium Scandium Titanium Vanadium Chromium Manganese Iron Cobalt Nickel Copper Zinc Gallium Germanium Arsenic Selenium Bromine Krypton Rubidium Strontium Yttrium Zirconium Niobium Molybdenum Technetium Ruthenium Rhodium Palladium Silver Cadmium Indium Tin Antimony Tellurium Iodine Xenon Caesium Barium Lanthanum Cerium Praseodymium Neodymium Promethium Samarium Europium Gadolinium Terbium Dysprosium Holmium Erbium Thulium Ytterbium Lutetium Hafnium Tantalum Tungsten Rhenium Osmium Iridium Platinum Gold Mercury (element) Thallium Lead Bismuth Polonium Astatine Radon Francium Radium Actinium Thorium Protactinium Uranium Neptunium Plutonium Americium Curium Berkelium Californium Einsteinium Fermium Mendelevium Nobelium Lawrencium Rutherfordium Dubnium Seaborgium Bohrium Hassium Meitnerium Darmstadtium Roentgenium Copernicium Nihonium Flerovium Moscovium Livermorium Tennessine Oganesson Be↑Mg↓Ca sodium ← magnesium → aluminium Atomic number (Z)12Groupgroup 2 (alkaline earth metals)Periodperiod 3Block s-blockElectron configuration[Ne] 3s2Electrons per shell2, 8, 2Physical propertiesPhase at STPsolidMelting point923 K (650 °C, 1202 °F) Boiling point1363 K (1091 °C, 1994 °F) Density (at 20° C)1.737 g/cm3[3]when liquid (at m.p.)1.584 g/cm3 Heat of fusion8.48 kJ/mol Heat of vaporization128 kJ/mol Molar heat capacity24.869[4] J/(mol·K) Vapor pressure P (Pa) 1 10 100 1 k 10 k 100 k at T (K) 701 773 861 971 1132 1361 Atomic propertiesOxidation statescommon: +2 0,[5] +1[6]ElectronegativityPauling scale: 1.31 Ionization energies1st: 737.7 kJ/mol 2nd: 1450.7 kJ/mol 3rd: 7732.7 kJ/mol (more) Atomic radiusempirical: 160 pm Covalent radius141±7 pm Van der Waals radius173 pm Spectral lines of magnesiumOther propertiesNatural occurrenceprimordialCrystal structure hexagonal close-packed (hcp) (hP2)Lattice constantsa = 320.91 pmc = 521.03 pm (at 20 °C)[3]Thermal expansion25.91×10−6/K (at 20 °C)[3][a]Thermal conductivity156[7] W/(m·K) Electrical resistivity43.9[8] nΩ·m (at 20 °C) Magnetic orderingparamagnetic Molar magnetic susceptibility+13.1×10−6 cm3/mol (298 K)[9]Young's modulus45 GPa Shear modulus17 GPa Bulk modulus35.4[10] GPa Speed of sound thin rod4940 m/s (at r.t.) (annealed)Poisson ratio0.290 Mohs hardness1–2.5 Brinell hardness44–260 MPa CAS Number7439-95-4 HistoryNamingafter Magnesia, Greece[11]DiscoveryJoseph Black (1755[11])First isolationHumphry Davy (1808[11])Isotopes of magnesiumve Main isotopes[12] Decay abundance half-life (t1/2) mode product 24Mg 79% stable 25Mg 10% stable 26Mg 11% stable Category: Magnesiumviewtalkedit | references Magnesium is a chemical element; it has symbol Mg and atomic number 12. It is a shiny gray metal having a low density, low melting point and high chemical reactivity. Like the other alkaline earth metals (group 2 of the periodic table), it occurs naturally only in combination with other elements and almost always has an oxidation state of +2. It reacts readily with air to form a thin passivation coating of magnesium oxide that inhibits further corrosion of the metal. The free metal burns with a brilliant-white light. The metal is obtained mainly by electrolysis of magnesium salts obtained from brine. It is less dense than aluminium and is used primarily as a component in strong and lightweight alloys that contain aluminium. In the cosmos, magnesium is produced in large, aging stars by the sequential addition of three helium nuclei to a carbon nucleus. When such stars explode as supernovas, much of the magnesium is expelled into the interstellar medium where it may recycle into new star systems. Magnesium is the eighth most abundant element in the Earth's crust[13] and the fourth most common element in the Earth (after iron, oxygen and silicon), making up 13% of the planet's mass and a large fraction of the planet's mantle. It is the third most abundant element dissolved in seawater, after sodium and chlorine.[14] This element is the eleventh most abundant element by mass in the human body and is essential to all cells and some 300 enzymes.[15] Magnesium ions interact with polyphosphate compounds such as ATP, DNA, and RNA. Hundreds of enzymes require magnesium ions to function. Magnesium compounds are used medicinally as common laxatives and antacids (such as milk of magnesia), and to stabilize abnormal nerve excitation or blood vessel spasm in such conditions as eclampsia.[15] Elemental magnesium is a gray-white lightweight metal, two-thirds the density of aluminium. Magnesium has the lowest melting (923 K (650 °C)) and the lowest boiling point (1,363 K (1,090 °C)) of all the alkaline earth metals.[16] Pure polycrystalline magnesium is brittle and easily fractures along shear bands. It becomes much more malleable when alloyed with small amounts of other metals, such as 1% aluminium.[17] The malleability of polycrystalline magnesium can also be significantly improved by reducing its grain size to about 1 μm or less.[18] When finely powdered, magnesium reacts with water to produce hydrogen gas: Mg(s) + 2 H2O(g) → Mg(OH)2(aq) + H2(g) + 1203.6 kJ/mol However, this reaction is much less dramatic than the reactions of the alkali metals with water, because the magnesium hydroxide builds up on the surface of the magnesium metal and inhibits further reaction.[19] The principal property of magnesium metal is its reducing power. One hint is that it tarnishes slightly when exposed to air, although, unlike the heavier alkaline earth metals, an oxygen-free environment is unnecessary for storage because magnesium is protected by a thin layer of oxide that is fairly impermeable and difficult to remove.[20] Direct reaction of magnesium with air or oxygen at ambient pressure forms only the "normal" oxide MgO. However, this oxide may be combined with hydrogen peroxide to form magnesium peroxide, MgO2, and at low temperature the peroxide may be further reacted with ozone to form magnesium superoxide Mg(O2)2.[21] Magnesium reacts with nitrogen in the solid state if it is powdered and heated to just below the melting point, forming Magnesium nitride Mg3N2.[22] Magnesium reacts with water at room temperature, though it reacts much more slowly than calcium, a similar group 2 metal.[20] When submerged in water, hydrogen bubbles form slowly on the surface of the metal; this reaction happens much more rapidly with powdered magnesium.[20] The reaction also occurs faster with higher temperatures (see § Safety precautions). Magnesium's reversible reaction with water can be harnessed to store energy and run a magnesium-based engine. Magnesium also reacts exothermically with most acids such as hydrochloric acid (HCl), producing magnesium chloride and hydrogen gas, similar to the HCl reaction with aluminium, zinc, and many other metals.[23] Although it is difficult to ignite in mass or bulk, magnesium metal will ignite. Magnesium may also be used as an igniter for thermite, a mixture of aluminium and iron oxide powder that ignites only at a very high temperature. Further information: Grignard reagent Organomagnesium compounds are widespread in organic chemistry. They are commonly found as Grignard reagents, formed by reaction of magnesium with haloalkanes. Examples of Grignard reagents are phenylmagnesium bromide and ethylmagnesium bromide. The Grignard reagents function as a common nucleophile, attacking the electrophilic group such as the carbon atom that is present within the polar bond of a carbonyl group. A prominent organomagnesium reagent beyond Grignard reagents is magnesium anthracene, which is used as a source of highly active magnesium. The related butadiene-magnesium adduct serves as a source for the butadiene dianion. Complexes of dimagnesium(I) have been observed.[24] The presence of magnesium ions can be detected by the addition of ammonium chloride, ammonium hydroxide and monosodium phosphate to an aqueous or dilute HCl solution of the salt. The formation of a white precipitate indicates the presence of magnesium ions. Azo violet dye can also be used, turning deep blue in the presence of an alkaline solution of magnesium salt. The color is due to the adsorption of azo violet by Mg(OH)2. Main article: Magnesium alloy Magnesium is brittle, and fractures along shear bands when its thickness is reduced by only 10% by cold rolling (top). However, after alloying Mg with 1% Al and 0.1% Ca, its thickness could be reduced by 54% using the same process (bottom). As of 2013, consumption of magnesium alloys was less than one million tonnes per year, compared with 50 million tonnes of aluminium alloys. Their use has been historically limited by the tendency of Mg alloys to corrode,[25] creep at high temperatures, and combust.[26] In magnesium alloys, the presence of iron, nickel, copper, or cobalt strongly activates corrosion. In more than trace amounts, these metals precipitate as intermetallic compounds, and the precipitate locales function as active cathodic sites that reduce water, causing the loss of magnesium.[26] Controlling the quantity of these metals improves corrosion resistance. Sufficient manganese overcomes the corrosive effects of iron. This requires precise control over composition, increasing costs.[26] Adding a cathodic poison captures atomic hydrogen within the structure of a metal. This prevents the formation of free hydrogen gas, an essential factor of corrosive chemical processes. The addition of about one in three hundred parts arsenic reduces the corrosion rate of magnesium in a salt solution by a factor of nearly ten.[26][27] Magnesium's tendency to creep (gradually deform) at high temperatures is greatly reduced by alloying with zinc and rare-earth elements.[28] Flammability is significantly reduced by a small amount of calcium in the alloy.[26] By using rare-earth elements, it may be possible to manufacture magnesium alloys that are able to not catch fire at higher temperatures compared to magnesium's liquidus and in some cases potentially pushing it close to magnesium's boiling point.[29] Main article: Magnesium compounds Magnesium forms a variety of compounds important to industry and biology, including magnesium carbonate, magnesium chloride, magnesium citrate, magnesium hydroxide (milk of magnesia), magnesium oxide, magnesium sulfate, and magnesium sulfate heptahydrate (Epsom salts).[30][31] As recently as 2020, magnesium hydride was under investigation as a way to store hydrogen.[32][33] Main article: Isotopes of magnesium Magnesium has three stable isotopes: 24Mg, 25Mg and 26Mg. All are present in significant amounts in nature (see table of isotopes above). About 79% of Mg is 24Mg. The isotope 28Mg is radioactive and in the 1950s to 1970s was produced by several nuclear power plants for use in scientific experiments. This isotope has a relatively short half-life (21 hours) and its use was limited by shipping times. The nuclide 26Mg has found application in isotopic geology, similar to that of aluminium. 26Mg is a radiogenic daughter product of 26Al, which has a half-life of 717,000 years. Excessive quantities of stable 26Mg have been observed in the Ca-Al-rich inclusions of some carbonaceous chondrite meteorites. This anomalous abundance is attributed to the decay of its parent 26Al in the inclusions, and researchers conclude that such meteorites were formed in the solar nebula before the 26Al had decayed. These are among the oldest objects in the Solar System and contain preserved information about its early history. It is conventional to plot 26Mg/24Mg against an Al/Mg ratio. In an isochron dating plot, the Al/Mg ratio plotted is 27Al/24Mg. The slope of the isochron has no age significance, but indicates the initial 26Al/27Al ratio in the sample at the time when the systems were separated from a common reservoir. See also: Magnesium production by country Magnesium sheets and ingots See also: Category:Magnesium minerals See also: Boninite Magnesium is the eighth-most-abundant element in the Earth's crust by mass and tied in seventh place with iron in molarity.[13] It is found in large deposits of magnesite, dolomite, and other minerals, and in mineral waters, where magnesium ion is soluble.[34] Although magnesium is found in more than 60 minerals, only dolomite, magnesite, brucite, carnallite, talc, and olivine are of commercial importance.[35] The Mg2+ cation is the second-most-abundant cation in seawater (about 1⁄8 the mass of sodium ions in a given sample), which makes seawater and sea salt attractive commercial sources for Mg. World production was approximately 1,100 kt in 2017, with the bulk being produced in China (930 kt) and Russia (60 kt).[36] The United States was in the 20th century the major world supplier of this metal, supplying 45% of world production even as recently as 1995. Since the Chinese mastery of the Pidgeon process the US market share is at 7%, with a single US producer left as of 2013: US Magnesium, a Renco Group company located on the shores of the Great Salt Lake.[37] In September 2021, China took steps to reduce production of magnesium as a result of a government initiative to reduce energy availability for manufacturing industries, leading to a significant price increase.[38] An Iranian worker tends to the Pidgeon process The Pidgeon process and the Bolzano process are similar. In both, magnesium oxide is the precursor to magnesium metal. The magnesium oxide is produced as a solid solution with calcium oxide by calcining the mineral dolomite, which is a solid solution of calcium and magnesium carbonates: CaCO3·MgCO3 → MgO·CaO + 2 CO2 Reduction occurs at high temperatures with silicon. A ferrosilicon alloy is used rather than pure silicon as it is more economical. The iron component has no bearing on the reaction, having the simplified equation:[citation needed] MgO·CaO +Si → 2 Mg + Ca2SiO4 The calcium oxide combines with silicon as the oxygen scavenger, yielding the very stable calcium silicate. The Mg/Ca ratio of the precursors can be adjusted by the addition of MgO or CaO.[39] The Pidgeon and the Bolzano process differ in the details of the heating and the configuration of the reactor. Both generate gaseous Mg that is condensed and collected. The Pidgeon process dominates the worldwide production.[40][41] The Pidgeon method is less technologically complex and because of distillation/vapour deposition conditions, a high purity product is easily achievable.[40] China is almost completely reliant on the silicothermic Pidgeon process. "Dow process (magnesium)" redirects here. For other Dow processes, see Dow process (disambiguation). Besides the Pidgeon process, the second most used process for magnesium production is electrolysis. This is a two step process. The first step is to prepare feedstock containing magnesium chloride and the second step is to dissociate the compound in electrolytic cells as magnesium metal and chlorine gas.[41] To extract the magnesium, calcium hydroxide is added to the seawater to precipitate magnesium hydroxide.[42] MgCl2 + Ca(OH)2 → Mg(OH)2 + CaCl2 Magnesium hydroxide (brucite) is poorly soluble in water and can be collected by filtration. It reacts with hydrochloric acid to magnesium chloride.[41] Mg(OH)2 + 2 HCl → MgCl2 + 2 H2O From magnesium chloride, electrolysis produces magnesium.[43] The basic reaction is as follows: MgCl2 → Mg(g) + Cl2(g) The temperatures at which this reaction is operated is between 680 and 750 °C.[41] The magnesium chloride can be obtained using the Dow process, a process that mixes sea water and dolomite in a flocculator or by dehydration of magnesium chloride brines. The electrolytic cells are partially submerged in a molten salt electrolyte to which the produced magnesium chloride is added in concentrations between 6–18%.[41] This process does have its share of disadvantages including production of harmful chlorine gas and the overall reaction being very energy intensive, creating environmental risks.[44] The Pidgeon process is more advantageous regarding its simplicity, shorter construction period, low power consumption and overall good magnesium quality compared to the electrolysis method.[20] In the United States, magnesium was once obtained principally with the Dow process in Corpus Christi TX, by electrolysis of fused magnesium chloride from brine and sea water. A saline solution containing Mg2+ ions is first treated with lime (calcium oxide) and the precipitated magnesium hydroxide is collected: Mg2+(aq) + CaO(s) + H2O(l) → Ca2+(aq) + Mg(OH)2(s) The hydroxide is then converted to magnesium chloride by treatment with hydrochloric acid and heating of the product to eliminate water: Mg(OH)2 + 2 HCl → MgCl2 + 2 H2O The salt is then electrolyzed in the molten state. At the cathode, the Mg2+ ion is reduced by two electrons to magnesium metal: Mg2+ + 2e− → Mg At the anode, each pair of Cl− ions is oxidized to chlorine gas, releasing two electrons to complete the circuit: 2Cl− → Cl2(g) + 2e− The carbothermic route to magnesium has been recognized as a low energy, y

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Portal: ChemistryMagnesium at Wikipedia's sister projects:Definitions from WiktionaryMedia from CommonsTextbooks from WikibooksResources from Wikiversity Retrieved from " 2Chemical compound Pharmaceutical compound 2-MDPIdentifiers IUPAC name 3-amino-2-methyl-1,1-di(phenyl)propan-1-ol CAS Number14326-31-9 YHCl: 14185-05-8 YPubChem CID26538ChemSpider24719 YUNIIB6FTK35FGCHCl: TJH732RKT9 YCompTox Dashboard (EPA)DTXSID90912320 Chemical and physical dataFormulaC16H19NOMolar mass241.334 g·mol−13D model (JSmol)Interactive image SMILES OC(c1ccccc1)(c2ccccc2)C(C)CN InChI InChI=1S/C16H19NO/c1-13(12-17)16(18,14-8-4-2-5-9-14)15-10-6-3-7-11-15/h2-11,13,18H,12,17H2,1H3 YKey:XGYCHIPEPHYUIH-UHFFFAOYSA-N Y (what is this?) (verify) 2-MDP (U-23807A) is a dissociative anaesthetic drug which has been found to be an NMDA antagonist and produces similar effects to PCP in animals. The levo or (−)-isomer is the active form of the drug.[1][2] It also has stimulant effects, having only around one third the potency of amphetamine by weight, but with a long duration of action, lasting more than 24 hours from a single oral dose.[3] The therapeutic action is said to exhibit appetite suppressant- and antidepressant-like activity.[4] 2-MDP synthesis In a variation of the nitrile-aldol reaction, combination of benzophenone (1) and propionitrile (2), in the presence of sodamide base and ethyl ether solvent, leads to 3-hydroxy-2-methyl-3,3-diphenylpropanenitrile (3).[5] The reduction of the intermediate nitrile group with lithium aluminium hydride completes the synthesis of 2-MDP (4). ^ Tang AH, Cangelosi AA, Code RA, Franklin SR (February 1984). "Phencyclidine-like behavioral effects of 2-methyl-3,3-diphenyl-3-propanolamine (2-MDP)". Pharmacology, Biochemistry, and Behavior. 20 (2): 209–213. doi:10.1016/0091-3057(84)90244-2. PMID 6718449. 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BasicsBenefitsConsiderationsDosageBottom lineGetting enough magnesium may support sleep health and improve mood. It may also lower your risk of cardiovascular disease and migraine episodes.Your body requires magnesium for more than 300 enzymatic reactions. A deficiency can have a drastic effect on your health.Although magnesium is found in a wide variety of foods, supplements can offer benefits, particularly for people with low intake. But with magnesium supplements available in a wide variety of forms and dosages, choosing one isn't always easy.This article looks at the benefits and side effects of magnesium supplements and highlights the various forms and dosages.Share on PinterestIryna Veklich/Getty ImagesMagnesium is the fourth most abundant mineral in your body. Your body can't work properly without it.The nutrient is essential for hundreds of metabolic processes and many other important bodily functions, from producing energy to building important proteins.Dietary sources of magnesium include:legumesnutsseedswhole grainsgreen leafy vegetablesMeat and fish contain smaller amounts.type 2 diabetesheart diseaseAlzheimer's diseaseatherosclerosis, or a narrowing of the arteries due to a cholesterol plaqueThough it's possible to get adequate amounts of magnesium from your diet, a supplement may be helpful if you have difficulty meeting your magnesium needs through food or if you have a deficiency.If you have a deficiency, it can take 20 to 40 weeks of magnesium supplementation to reach a steady level.While more research is needed, magnesium supplementation in people with a deficiency can have health benefits:Taking magnesium supplements may help reduce blood pressure levels.Studies show that people with high blood pressure may see improvements when supplementing this mineral.A 2021 review of 7 studies associated supplementing with a dose of 300 mg or more of magnesium daily for at least 12 weeks with a 5.78 mm Hg drop in systolic and a 2.5 mm Hg drop in diastolic blood pressure in participants with type 2 diabetes.Magnesium plays an important role in sleep.People with low magnesium levels are more likely to experience sleep problems, such as difficulties falling or staying asleep. A review of 3 studies among older adults found that supplementing with 320 to 720 mg of magnesium daily for up to 8 weeks decreased the time it took them to fall asleep and increased total sleep time compared with placebo. According to another study, magnesium supplementation may help people, especially older adults, fall asleep quicker and stay asleep longer.Learn more about magnesium supplements for sleep.Some studies link low levels of magnesium with depression, and this has led researchers to wonder whether supplementing with this mineral could help treat this condition.According to a 2023 review of studies, magnesium supplementation may help reduce symptoms of depression in adults with depressive disorder. However, the authors note that more studies with larger sample sizes and longer follow-ups are still needed.Magnesium plays a crucial role in insulin and glucose metabolism.Many people with type 2 diabetes, a condition that impacts blood sugar, have a magnesium deficiency because high blood sugar or insulin levels can increase the amount of this nutrient lost through urine.Some researchers hypothesize that taking magnesium supplements may improve insulin resistance, a metabolic issue in which your cells don't respond properly to insulin.Insulin is a hormone that helps regulate your blood sugar levels, and improving insulin resistance can promote better blood sugar management, especially in people with diabetes.However, experts are divided on whether magnesium supplements actually help regulate blood sugar in practice, with different studies having conflicting findings.Though more research is needed, magnesium supplements may help stabilize blood sugar in people with type 2 diabetes and a magnesium deficiency.Low magnesium levels are linked to an increased risk of heart disease. One reason for this may be that low levels negatively affect heart disease risk factors such as blood sugar and blood pressure.Eating a diet rich in foods high in magnesium can lower your risk of heart disease. But this may also result from the combination of other beneficial nutrients in these foods, such as potassium and calcium. More research is needed to determine the effects of magnesium alone.According to a 2020 study, taking oral magnesium supplements may improve levels of certain proteins associated with a lower risk of cardiovascular disease. However, more research is needed to determine if this lowers the risk of developing cardiovascular disease.While these results are promising, more studies are needed to determine the possible benefit.A magnesium deficiency may increase the risk of migraine, a neurological condition characterized by intense, recurring headaches that occur with additional symptoms. While more research is needed, a daily dose of 400 to 600 mg of magnesium may help prevent migraine in people with a magnesium deficiency. This dosage is slightly higher than the recommended value provided by the Food and Drug Administration (FDA). A 2018 review of 5 studies showed that treating migraine with a high 600-mg dose of magnesium was safe and effective.Still, more studies are needed before firm dosage recommendations can be made for treating migraine. Summary Taking a magnesium supplement to address a deficiency has been linked to health benefits. These include:improvements in blood pressuremoodblood sugar managementlower risk of developing health conditions such as heart diseaselower risk of migraine episodes, in people who have migraineExperts currently do not recommend magnesium supplements for people who do not have a magnesium deficiency. Though magnesium supplements are generally considered safe, you should check with a healthcare professional before taking them, especially if you have a medical condition.Most people who take magnesium supplements don't experience side effects, but magnesium can cause gut-related issues, especially when taken in large doses. Side effects can include:People with kidney issues are at a higher risk of experiencing adverse effects related to magnesium supplements, including toxicity, if their levels become too high.Additionally, there's no evidence that supplementing magnesium supports health in people who don't have a deficiency. So if you're not experiencing any effects of magnesium deficiency, or if you know you don't have one, you probably don't need to take a supplement.Always speak with a healthcare professional before starting or stopping any supplements.A diet high in magnesium includes healthy whole foods such as:whole grainsnutsseedslegumesIt's possible to get the daily recommended amount of the mineral through diet alone. This is 400 to 420 mg for males and 320 to 360 mg for females. However, many modern diets are low in magnesium-rich foods.If you can't get enough magnesium through your diet, and if it's safe for you to do so, you may want to take a supplement.That means a supplement can provide 100% or more of the Reference Daily Intake (RDI).The tolerable upper limit for supplemental magnesium is 350 mg per day. Below this level, you're unlikely to experience any digestive side effects.If you have a deficiency, you may need a higher dose, but you should check with a healthcare professional before taking large doses of magnesium that exceed this limit. Better absorbed types include:magnesium citratemagnesium lactatemagnesium aspartatemagnesium chlorideSupplements are available in a variety of delivery systems, such as pills, gummies, powders, and liquids.The delivery system doesn't make much of a difference in terms of absorption, so choose one that you prefer.Also, when shopping for a supplement, choose brands with third-party verification, which indicates that the supplement has been tested for potency and contaminants.The mineral magnesium is essential for keeping your body functioning at its best. Adequate magnesium intake has been linked to a reduced risk of heart disease, type 2 diabetes, and other conditions. Dietary sources of magnesium include nuts, leafy greens, legumes, and seeds.Taking a supplement can help you meet your daily needs if you don't get enough of this important nutrient from food alone. Side effects are unlikely at doses below 350 mg per day.If you're interested in trying a supplement, choose a product that contains a well-absorbed form of magnesium, such as magnesium citrate, and that has been tested by a third party, such as USP.Magnesium supplements are widely available in stores and online.Healthline has strict sourcing guidelines and relies on peer-reviewed studies, academic research institutions, and medical journals and associations. We only use quality, credible sources to ensure content accuracy and integrity. You can learn more about how we ensure our content is accurate and current by reading our editorial policy.Allen MJ, et al. (2023). Magnesium. A, et al. (2020). Effect of magnesium supplementation on circulating biomarkers of cardiovascular disease. 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