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LATENT THERAPEUTIC GAINS OF BEETROOT JUICE

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ABSTARCT

Juices of fruits and veggies are very precious, they are rich in vitamins, microelements and other useful and necessary minerals. Juices are drunk not only to quench thirst or because of their wonderful taste, they are used to restore and strengthen the health. Today there is a whole new trend called juice therapy. Beet juice is widely used in this field, since it contains all the useful properties of beets. Beetroot juice benefits and side effects that come with it, should be known to everyone. If you want to improve your athletic performance and stamina, there's no real substitute for simply putting time into working out. 100g of beetroot juice provides 42 kcal; 1.0 g protein; 0 g fat & 9.9 g carbohydrates. But if it if you're looking for a simple, natural way to increase the time-span of your exercises, or if you just want to give yourself that little edge in endurance or speed, then beet juice may be the answer. Beetroot juice is rich in vitamins, phytochemicals, though beetroot contains almost no vitamin A, but the leaves have large quantities of this vitamin. Beetroot contains large amounts of iron and folic acid, which have a favorable effect on the blood, improve red blood cell production, increase the level of hemoglobin and hence improve the nutrition of the cells with oxygen. Iodine contained in beet juice is beneficial to the thyroid gland and improves processes in human memory. Benefits of beet juice also lies in its cleansing properties. Salts of Mg, Na and Ca contained in large amounts have a complex effect on the vasculature and circulatory system. Mg prevents the formation of blood clots, cleanses the blood vessels from cholesterol plaques, improves lipid metabolism and normalizes digestion. Na and Ca, which are of the optimum ratio in beets (50% Na & 5% of Ca) remove excess Ca from the body that is deposited on the walls of

blood vessels. Therefore beet juice is extremely useful in thrombophlebitis, varicose veins, hypertension and other diseases of the circulatory system. The beet juice contains trace elements. Beets perfectly cleanse the intestines, stimulate their performance and improve peristalsis. Beet juice benefits the immune system, increases the body's resistance to a variety of disease agents. Drinking beet juice helps improve physical activity and reduces negative effects of exercises on the body. Therefore it is often drunk by athletes and people who work in difficult conditions. In this manuscript, amazing potential of beetroots' therapeutic applicability and role in boosting athletic performance is delineated precisely.

Keywords: *Minerals; Nitrate; Ergogenic effects; Methemoglobin; NOS; Antioxidants; ATP; DASH; LD50; Cycling tasks; Sporty concert*

INTRODUCTION

Beet juice is naturally high in nitrate (-NO_3), which the body uses to make both nitrite (-NO_2) and nitric oxide (NO). Nitrite is known to protect the blood vessels from injury, while nitric acid (HNO_3) expands blood vessels and therefore increases the flow of oxygen to the cells. This, in turn, increases both the power available to the muscles and the length of time that the muscles can exercise without tiring.

Early studies into the effectiveness of beet juice for exercise showed that people who drink the juice for several days before undergoing exercise tests do indeed use less oxygen in their muscles, and are correspondingly able to exercise for longer. In one study, drinking beet juice

decreased oxygen needs by 19 per cent and increased exercise endurance time by 17 per cent. In other studies, scientists proved that drinking beet juice increases people's blood concentration of nitrates, and that beet juice which has had the nitrates artificially removed loses its exercise-boosting power. Known for decades as a liver-protective food, beets may not be the newest youngster on the superfood block, but mounting research is showing why you should take another good look at this root vegetable in juiced form. Many of the persons have mentioned that juicing beets will give them more energy for their day. Research is showing that this may be due to the ability of components in the juice to improve blood flow. Beetroot juice has been shown to help the body respond better to exercise, by balancing oxygen use and increasing stamina. Beetroot juice is one of the richest dietary sources of antioxidants and naturally occurring nitrates. Nitrates are compounds which improve blood flow throughout the body – including the brain, heart, and muscles. These natural nitrates increase a molecule in the blood vessels called nitric oxide, which helps open up the vessels and allows more oxygen flow as well as lower blood pressure. Beetroot juice may also be an important ally to lower blood pressure. Whether the yellow or red kind of beets, the juice provides excellent blood pressure-lowering ability. Meta-analysis (a quality study that reviewed many past studies) of 254 people between 2006 and 2012 showed clear reductions in blood pressure, with the systolic blood pressure (the number on top) showing the best reduction. In many cases, eating the whole food is the best way to get all the nutrients, fiber and healthy effect. But, in this particular case for blood pressure lowering, you are actually better off drinking the juiced beet root to get the maximum benefit. When you cook the beet or ferment a beet (like we find in a pickled beet), the amount of healthful nutrients for blood pressure benefits will decrease. By juicing, you are going to get 100% of the phytonutrients (plant chemicals) that help your blood pressure decrease. 1 to 2 cups of beetroot juice a day have been shown to have a significant effect for lowering blood pressure. Many doctors have been quite surprised by how little was needed to see a benefit for people with high blood pressure. Beets are a potent detoxifier. Please note it is important to not change any prescription blood pressure medication without speaking to your prescribing doctor. Please let your doctor know you are using natural means to lower your blood pressure, which may result in requiring less medication. Cured foods like hot dogs and bacon are known to be high in *nitrites*, which are known cancer-causing compounds. Beets, spinach and radishes all have naturally occurring *nitrates*, which will convert to nitrites during digestion in the body. These naturally occurring versions are not harmful to the body and are very safe when they are

eaten with the wonderful natural antioxidants that beets and radishes also provide. The more dangerous nitrites that are added to hot dogs, bacon and cured meats are really the ones to worry about and should be minimized.

SPORTY CONCERT

While early studies focused on whether beet juice can increase the time before an athlete becomes exhausted, more recent studies have focused on the juice's real-world effects on athletic performance. For example, a study published in 2011 in the journal *Medicine & Science in Sports and Exercise (MSSE)* found that cyclists who drank beet juice and then rested for 2.75 hours were able to complete a 4 km cycling task 11 seconds faster than cyclists who had consumed a nitrate-depleted beet juice placebo. The experimental group also completed a 16.1 km task 45 seconds faster than the control group. More recently, researchers from Maastricht University Medical Centre (MUMC) in the Netherlands conducted a pair of beet juice studies, both published in the *International Journal of Sport Nutrition and Exercise Metabolism (IJSNEM)* in 2012. In the first, the researchers had 12 male cyclists with an average age of 31 drink 140 mL per day of either normal beet juice or a nitrate-depleted placebo for six days. The men then participated in a 60-minute cycling exercise and a 10 km timed cycling trial. After a 14-day washout period, participants were given the other beverage and the trial was repeated.

As expected, the researchers found that cyclists performed better following the nitrate-rich beet juice treatment in both time and power output. In the second study, cyclists drank the beet juice just 2.5 hours prior to performing the cycling trial, as in the 2011 study. But this time, no difference was seen in performance between the nitrate-rich and nitrate-depleted groups. It’s not known whether dietary nitrate is effective only at certain exercise intensities or certain exercise durations. For example, two Maastricht studies differed not only in when the beet juice was provided, but also in how long the cycling trial lasted. In the first study, participants cycled for between 14 and 18 minutes (10 km), while in the second they cycled for one hour (40 to 50 km). Thus we do not know yet whether the ergogenic effects of dietary nitrate depend on the duration of supplementation or the actual exercise itself (i.e. higher intensity exercise, shorter duration)[15].

Drinking beetroot juice can boost your stamina and athletic performance, scientific studies have confirmed. One of the first such studies, conducted by researchers from the *University of Exeter* and published in the *Journal of Applied Physiology (JAP)* in 2010, looked at seven men who consumed either 500 mL per day of beetroot juice or placebo for six consecutive days. On the last three days, the men's metabolic performance was tested as they underwent both low-intensity and high-intensity step exercises. The researchers found that the muscles of the men who drank beetroot juice needed less ATP to produce the same force, meaning that their bodies needed less oxygen. This allowed those men to perform high-intensity exercise for longer before becoming exhausted, in comparison with men who drank the placebo. In a similar study, beetroot juice was found to reduce the oxygen needed in moderate-intensity cycling by 19 per cent, and to increase the amount of time participants could perform high-intensity cycling by 17 per cent.

Beetroot first attracted the attention of sports researchers because it is naturally high in nitrate ($-NO_3$), a compound that the body metabolizes into nitrite ($-NO_2$) and nitric oxide. Nitric

oxide is known to help regulate muscle contraction, blood flow, the balance of blood sugar and calcium, and cellular energy use. It is also a powerful vasodilator that helps regulate blood pressure and inhibit inflammation. By expanding the blood vessels, nitric oxide increases the efficiency of oxygen in reaching the cells, thereby decreasing the overall amount of oxygen that the body needs. Nitrite has also been shown to help prevent blood vessels from injury and appears to play a role in maintaining a healthy cardiovascular system. To test whether it was really the nitrate content of beetroot juice that was responsible for its stamina-boosting effects, the researchers conducted a follow-up study in which they proved that consumption of beetroot juice more than doubled the blood concentration of nitrates in participants. Other studies have shown that beetroot juice that has had the nitrates artificially removed does not provide the same benefits as natural juice. All these studies; however, suffered from an important flaw: rather than evaluating actual athletic performance, they merely evaluated how long an athlete could perform before becoming exhausted.

To compensate for this weakness, researchers performed another study in which participants were timed performing four kilometers and 16.1 km cycling tasks. All participants had rested for 2.75 hours before beginning the test, and had been assigned to consume either 500 mL of beetroot juice or the same amount of a nitrate-depleted beetroot juice placebo. As expected, the researchers found that participants in the beetroot juice group completed the task significantly faster than those in the placebo group (11 seconds faster for the 4 kilometers task 11 seconds faster and 45 seconds faster for the 16.1 km task). While beetroot juice is safe, inorganic nitrates like potassium nitrate (KNO_3) can be toxic. Also, high-nitrate diets (including nitrates from beetroot juice) may interact with some pharmaceutical drugs.

A diet rich in vegetables has cardiovascular benefits that have long been well documented. It's been proposed that these health effects may be due, in part, to vegetables' high nitrate content. While nitrate is found in all vegetables, it's especially abundant in beetroot and leafy greens. Dietary nitrate lowers blood pressure, thereby helping protect the heart[1]. Recent research suggests that dietary nitrate supplementation in the form of beetroot juice not only decreases blood pressure but also reduces the amount of oxygen needed during exercise and enhances athletic performance[2]. The blood pressure and athletic performance benefits are likely mediated through the metabolic conversion of dietary nitrate (NO_3) to biologically active nitrite (NO_2) and then to nitric oxide. Nitric oxide has numerous functions in the body, including the regulation of blood flow, muscle contractility, glucose and calcium

homeostasis, and mitochondrial respiration and biogenesis[3]. This continuing education activity will provide a comprehensive review of recent research findings on the health benefits of beetroot juice and evaluate how nitrate lowers blood pressure, reduces the oxygen cost of exercise, and improves athletic performance.

Dietary nitrate is absorbed rapidly from the stomach and small intestine. About 25 per cent of ingested nitrate enters the enterosalivary circulation, where it's reduced to nitrite by bacterial nitrate reductases from symbiotic anaerobic bacteria on the surface of the tongue. This nitrite is swallowed and reduced to nitric oxide in the acidic environment of the stomach or is absorbed via the gastrointestinal tract and reenters the circulation as nitrite. Nitric oxide is a potent vasodilator that governs systemic blood pressure and retards atherogenesis by inhibiting inflammatory cell recruitment and platelet aggregation. Nitric oxide is generated by 2 known pathways: the oxidation of L-arginine by endothelial nitric oxide synthase (NOS), requiring the presence of oxygen and several essential cofactors, and by the reduction of nitrate-derived nitrite to nitric oxide[1,3].

Numerous cardiovascular pathologies (atherosclerosis and cardiovascular disease risk factors such as hypertension and hyperlipidemia) are associated with endothelial dysfunction and diminished nitric oxide activity. Nitrite derived from dietary nitrate provides an alternative source of vasoprotective nitric oxide via the nitrate-nitrite-nitric oxide pathway when conventional nitric oxide synthesis is impaired. Thus, during ischemia or hypoxemia (conditions that inactivate endothelial nitric oxide synthase), nitrate helps preserve nitric oxide production[1,3]. Independent of its role as a source of nitric oxide, nitrite provides protection against ischemia/reperfusion injury in the myocardial, hepatic, renal, pulmonary, and cerebral vasculature. Nitrite also causes dose-dependent vasodilatation in the brachial

artery of healthy individuals, indicating that it may have an important role in maintaining normal cardiovascular homeostasis[1]. Webb et al. (2008) evaluated the effects of 0.5 L of beetroot juice (22.5 mmol of nitrate) on blood pressure, plasma nitrite concentrations, and endothelial function. Systolic blood pressure dropped 10.4 mm Hg three hours after ingestion, and diastolic blood pressure fell 8 mm Hg 2 1/2 hours after ingestion. Plasma nitrite increased twofold after beetroot juice ingestion, reached a peak at three hours, and correlated with the decreases in blood pressure. Researchers measured endothelial function by brachial artery flow-mediated vasodilation after ischemic occlusion of the forearm. Beetroot juice significantly prevented endothelial dysfunction induced by an acute ischemic insult in the forearm and attenuated ex vivo platelet aggregation. The researchers also evaluated the effect of spitting out all saliva during and after beetroot juice ingestion on blood pressure and plasma nitrate concentrations. Spitting out saliva interrupted the enterosalivary circulation, thereby preventing nitrite-rich saliva from reaching the stomach. Compared with swallowing, spitting blocked the rise in plasma nitrite concentration, prevented the decrease in systolic blood pressure, and had no effect on platelet aggregation. Thus, the physiological effects of dietary nitrate are due to the production of nitrite from symbiotic anaerobic bacteria on the surface of the tongue rather than from the nitrate itself.[1]

Preliminary research suggested that consuming a large dose of pharmaceutical sodium nitrate ($NaNO_3$) (0.1 mmol/kg/day for 3days) resulted in a lower oxygen cost during submaximal cycling[4]. In practical terms, the nitrate supplementation improved exercise economy—the muscles used less oxygen for a given work rate. This finding was surprising and challenged a fundamental principle of human exercise physiology: During submaximal exercise, there's a predictable oxygen cost for a given work rate. Furthermore, the increase in oxygen uptake is linearly related to the increase in work rate, and this relationship can't be altered. As a result, Bailey et al. (2010) researchers became interested in whether they could obtain similar results when administering the nitrate dose in the form of nitrate-rich beetroot juice. This distinction is important since sodium nitrate is considered a drug, whereas beetroot juice is a natural food product individuals can readily include in the diet[2].

Nitrate levels in vegetables and vegetable juices can vary considerably, depending on many factors. So to provide a consistent nitrate dose (~5 to 6 mmol), most of the studies evaluating the effect of beetroot juice on the oxygen cost of exercise have used Beet It beetroot juice.

Bailey et al. (2010) evaluated the effect of beetroot juice consumption for six days on the oxygen cost of moderate- and high-intensity exercise, blood pressure, and plasma nitrite concentrations. The subjects consumed 0.5 L of Beet It (5.5 mmol of nitrate) or placebo (a black current cordial with negligible nitrate) for six days and completed a series of low- and high-intensity cycling tests on the last three days. On days 4 to 6, plasma nitrite concentration was significantly higher and systolic blood pressure was dramatically lower (8 mm Hg) in subjects who drank beetroot juice compared with placebo. The beetroot juice significantly reduced the oxygen cost of moderate-intensity cycling exercise by 19per cent and increased the time to exhaustion during high-intensity cycling by 17 per cent[2].

Bailey et al. (2010) conducted a follow-up study to determine the mechanisms by which beetroot juice lowered the oxygen cost of moderate-intensity exercise and improved tolerance of high-intensity exercise. Subjects consumed 0.5 L of Beet It (5.1 mmol of nitrate) or placebo (the black current cordial) for six days and completed a series of low- and high-intensity knee extensor exercises in the prone position on the last three days. Beetroot juice more than doubled plasma nitrite concentration and reduced the oxygen cost and rate of phosphocreatine breakdown during low- and high-intensity exercise. Compared with placebo, beetroot juice significantly lowered systolic blood pressure by 5 mm Hg and diastolic blood pressure by 2 mm Hg. Beetroot juice greatly reduced the oxygen cost of moderate-intensity knee extensor exercise by 25per cent and increased the time to exhaustion during high-intensity knee extensor exercise by 25per cent[5]. Beetroot juice appears to lower the oxygen cost of exercise by reducing the total ATP cost of muscle force production—the muscles use less ATP to produce the same amount of work. Beetroot juice also decreases the breakdown of phosphocreatine (the limited reserve of high-energy phosphate that resynthesizes ATP), thus lessening muscle metabolic disruption. These changes may be due to an increased efficiency of mitochondrial oxidative phosphorylation or increased efficiency of calcium transport by the sarcoplasmic reticulum Ca-ATPases. Dietary nitrate supplementation also may improve exercise performance by increasing blood flow to the exercising muscles and improving the match between blood flow and oxygen uptake[5-7].

Bailey et al. (2010) noted that the protective effect of nitrite on infarct size that's been reported in experimental models of myocardial ischemia may be due to a nitric oxide-mediated reduction in the energy (and oxygen cost) of contraction in the heart in addition to

enhanced perfusion of ischemic areas[5]. Vanhatalo et al. (2010) investigated the acute (2 1/2 hour) and chronic (up to 15 days) effects of dietary nitrate supplementation on blood pressure and the physiological responses to moderate-intensity and incremental cycling exercise. The subjects consumed 0.5 L of Beet It (5.2 mmol of nitrate) or placebo (the black current cordial). The exercise protocol (two moderate-intensity step tests followed by a ramp test) was repeated 2 1/2 hours following the first ingestion and after five and 15 days[3]. Beetroot juice significantly elevated plasma nitrite concentration throughout the 15-day test period, and this was accompanied by a marked reduction in systolic (4 mm Hg) and diastolic (4 mm Hg) blood pressure. These effects tended to be more pronounced after 12 days of dietary nitrate supplementation. Compared with placebo, the oxygen cost during moderate exercise was acutely reduced by 4per cent after 2 1/2 hours and remained similarly lowered after 5 and 15 days of continual beetroot juice ingestion. While beetroot juice had no acute effects on maximal oxygen uptake (VO_2 max) and the gas exchange threshold, these parameters of aerobic fitness rose after 15 days of supplementation[3].

The oxygen cost of moderate exercise didn't decrease as much as in previous studies, but the subjects' normal dietary nitrate intake wasn't restricted at any time during the study period[3]. It's assumed that beetroot juice reduces blood pressure and the oxygen cost of exercise through the metabolic conversion of inorganic nitrate to bioactive nitrite and then nitric oxide. However, since beetroot juice also is rich in several metabolically active compounds (betaine, antioxidants, and polyphenols), it's uncertain whether the cardiovascular and physiological changes observed following beetroot juice ingestion can be attributed exclusively to its high nitrate content[8]. For example, the amino acid betaine has been used in the treatment of cardiovascular disease. The high antioxidant content of beetroot juice may provide protection against exercise-induced oxidative stress. Beetroot juice also contains the polyphenols quercetin and resveratrol, which have been linked with mitochondrial biogenesis and an associated increase in aerobic capacity. Thus, beetroot juice has the potential to influence blood pressure and exercise performance via numerous pathways[8].

Lansley et al. (2011) conducted a study to determine whether the physiological effects of beetroot supplementation (reduced blood pressure, lowered oxygen cost of submaximal exercise, and enhanced tolerance to a high-intensity workout) were due to the juice's high nitrate content. The researchers provided a nitrate-depleted beetroot juice to serve as a

placebo, which was similar in appearance, odor, taste, and texture to the nitrate-rich beetroot juice. This allowed the researchers to isolate the effects of dietary nitrate from the other potential active ingredients found in beetroot juice and ensured a genuinely double-blind experimental design[8]. The subjects consumed 0.5 L of Beet It (6.2 mmol of nitrate) or the nitrate-depleted beetroot juice placebo (0.003 mmol of nitrate) for 6 days. They engaged in treadmill exercise and knee extension tests on days 4 and 5. The nitrate-rich beetroot juice significantly raised plasma nitrite concentration and decreased systolic blood pressure by 4per cent (5 mm Hg) compared with placebo. The nitrate-rich beverage also lowered the oxygen cost of walking by 12per cent and moderate- and high-intensity running by 7per cent. The nitrate-rich juice also increased the time to exhaustion during high-intensity running by 15per cent and during incremental knee extension exercise by 5per cent[8]. The consumption of nitrate-depleted beetroot juice didn't alter any of the experimental variables at rest or during exercise compared with the nonsupplemented controls. These results indicate that the positive physiological effects of beetroot juice ingestion on blood pressure and exercise performance are due to the high nitrate content rather than other compounds[8].

Most studies evaluating the performance effects of beetroot juice have used time-to-exhaustion protocols, which test exercise capacity, not athletic performance, and have been criticized as having limited validity in the athletic setting. A superior test of the effectiveness of beetroot juice as an ergogenic aid would involve subjects covering a certain distance in the fastest time possible—a time trial[9]. Lansley et al. (2011) evaluated the effect of beetroot juice consumption on power output, oxygen uptake, and performance during 4-km and 16.1-km cycling time trials. The subjects' normal dietary nitrate intake wasn't restricted at any time during the study. The competitive male cyclists consumed 0.5 L of Beet It (6.2 mmol of nitrate) or a nitrate-depleted beetroot juice placebo (0.0047 mmol of nitrate) and rested for 2 3/4 hours before completing either a 4- or 16.1-km bicycle time trial.

The nitrate-rich beetroot juice significantly increased plasma nitrite concentrations and decreased systolic blood pressure by 6 mm Hg. The oxygen uptake values weren't significantly different between the beetroot juice and placebo time trials. However, the nitrate-rich beetroot juice significantly increased mean power output during the 4-km time trial (292 vs. 279 watts) and the 16.1-km time trial (247 watts vs. 243 watts) compared with placebo. As a result, beetroot juice improved performance by 2.8per cent (11 seconds) in the

4-km time trial and by 2.7per cent (45 seconds) in the 16.1-km time trial. The improved time trial performance following beetroot juice ingestion was due to a significantly higher power output for the same oxygen uptake—7per cent to 11per cent greater power output per liter of oxygen consumed[9]. Based on the length of time it took the subjects to complete the time trials, the results suggest that dietary nitrate supplementation has the potential to improve performance in events lasting five to 30 minutes. Statistical analysis to derive the true effect of the intervention indicated that dietary nitrate supplementation may have a practical and meaningful benefit for athletic performance.9 In the real world, an 11-second advantage in a 4-km cycling time trial and 45-second advantage in a 16.1-km cycling time trial separate the podium finishers from the rest of the pack.

In addition to the research examining the effects of beetroot juice on blood pressure and athletic performance, studies have evaluated its impact on exercise tolerance in patients with peripheral artery disease, a type of cardiovascular disease in which atherosclerotic occlusions impair blood flow to the lower extremities and cause intermittent claudication (ischemic leg pain that occurs with walking and improves with rest). In one study, Kenjale and colleagues gave subjects 0.5 L of Biotta beetroot juice (9 mmol of nitrate) or placebo (orange juice with negligible nitrate content) three hours before undergoing a maximal cardiorespiratory exercise test[10]. The beetroot juice significantly increased plasma nitrite concentration. Beetroot juice ingestion dramatically reduced diastolic blood pressure at rest and during the maximal cardiorespiratory exercise test. In addition, the subjects walked 18per cent longer before the onset of claudication pain and were able to walk 17per cent longer following the consumption of beetroot juice compared with those who received the placebo. Thus, beetroot juice ingestion significantly increased exercise tolerance by almost 20per cent—a statistically and clinically significant increase in functionality for a disease state characterized by reduced physical function and quality of life[10]. In addition to the lower blood pressure, measures of gastrocnemius (calf muscle) tissue oxygenation suggest that increased tissue perfusion was responsible for the improvement in exercise tolerance. Since there was no change in endothelial function, researchers surmise that the beetroot juice probably improved peripheral blood flow in areas of tissue hypoxia by increasing nitric oxide production[10].

These findings have encouraged some endurance athletes to consider supplementing with inorganic nitrate salts (sodium or potassium nitrate) to reduce the oxygen cost of exercise and

improve performance. This has raised concern among researchers, who caution against the uneducated and uncontrolled use of nitrate salts, and especially nitrite salts, to enhance performance. Nitrate salt is used to preserve food. While inorganic nitrate is nontoxic at higher doses, inorganic nitrite can cause serious harm at considerably lower levels. The LD50, or lethal dose, for nitrite (100 to 200 mg/kg) is comparable to that of cyanide. Nitrite toxicity is due to elevated methemoglobin levels (an oxidized form of hemoglobin that has an increased affinity for oxygen) and may cause life-threatening tissue hypoxia. In high doses, nitrite also may cause hypotension, especially if combined with other vasodilatory drugs[11]. The researchers also note that nitrate-containing vegetable juice presents a potential risk if it's stored incorrectly. If bacteria that convert nitrate to nitrite contaminate the juice, high levels of nitrite could accumulate over time, which could be potentially harmful. Athletes and other individuals also may be confused about the differences between inorganic nitrate (found in dietary sources such as beetroot juice, vegetables, and nitrate salts), organic nitrates (e.g., the drug nitroglycerine), and organic nitrites (e.g., the drug amyl nitrite). Organic nitrates and nitrites are extremely potent vasodilators, and an unintentional overdose can lead to fatal vascular collapse. While the acute toxicity of inorganic nitrate is very low, any confusion that could lead to a large unintentional intake of organic nitrates or nitrites is potentially life threatening[11].

On the other hand, consuming dietary nitrate from vegetables or vegetable juice is presumed safe[11-13]. In fact, diets high in dietary nitrate are associated with reduced blood pressure and a decreased incidence in cardiovascular disease[16]. Dietary nitrate may represent an effective treatment for hypertension in addition to current medication regimens[1,3,10,14]. The Dietary Approaches to Stop Hypertension (DASH) diet provides ~20 mmol of nitrate per day (about the amount provided in the Webb study and twice that provided in the Kenjale study) and has reduced blood pressure in both normal and hypertensive subjects. Individuals with cardiovascular disease or related risk factors should consult their physician before consuming a high-nitrate diet. Also, certain medications may adversely interact with a high-nitrate diet, including organic nitrate or nitrite drugs used for angina and PDE-5 inhibitors such as sildenafil citrate, tadalafil, and vardenafil[12]. As with most substances ingested to affect the body's structure or function, the dosage and formulation often determine whether the effects are beneficial or detrimental. As with other nutritional supplements, it's essential to consider the risk/benefit ratio when evaluating the effects of dietary nitrate ingestion on human

physiology. More research is needed to determine the optimal amounts of dietary nitrate to reduce blood pressure and enhance athletic performance[11-13].

Beetroot juice is an easy way to quickly ingest a substantial amount of dietary nitrate. However, some individuals may find the taste of beetroot juice unpleasant. Furthermore, it can cause red urine and stools. Fortunately, beetroots are just one of many vegetables that are high in nitrate. Leafy green vegetables tend to be the top sources. The dose of dietary nitrate used in the research to reduce the oxygen cost of exercise, improve athletic performance, and lower blood pressure ranges from 300 to 500 mg[11]. Patients can readily obtain these amounts through their diet. For instance, foods such as celery, cress, chervil, lettuce, red beetroot, spinach, and arugula (rocket or rucola) contain very high nitrate levels (more than 250 mg/100 g), and celeriac, Chinese cabbage, endive, fennel, kohlrabi, leeks, and parsley are among those with high nitrate levels (~100 to 250 mg/100 g).14 More specifically, 1 cup of raw spinach contains ~900 mg of nitrate; 1/2 cup cooked collard greens, ~200 mg; 1 cup raw leaf lettuce, ~100 mg; and 1/2 cup vegetable juice.

SIDE EFFECTS OF BEET JUICE

Beet juice benefits are obvious, but there are some side effects as well.

- Because beet juice is a laxative and diuretic, it can cause intestinal upset
- 1-2 cups of undiluted juice lowers pressure as a consequence it may cause weakness and dizziness
- Limit the consumption of the drink if you suffer from urolithiasis or hypertension
- Since beet juice stimulates cleansing of the liver and if there are stones in the bile duct then it can cause serious health problem

The dark carotenes of beet juice may give ones urine and bowel movements a red color. This color change is harmless. Since beets are high in oxalates, people who tend to make oxalate kidney stones may want to avoid beet juice. Beet juice can cause allergic effects too. Allergic reactions include fever, chills, rash, burning sensation or itching. If you are experiencing any of the above symptoms after drinking of beetroot juice, consult a therapeutic connoisseur.

BEET JUICE GUIDELINES AND PRECONCEPTION

- Beetroot juice can be used as an antiseptic for colds – gargling and dripping nose
- If one treats anemia he or she should mix the juice with honey 1:1
- Mixing cranberry and beet juices 2:1, you can quickly remove the stress and improve your sleep
- For gastritis, gastric and duodenal ulcers add boiled beets to the diet
- For women to normalize periods mix beetroot juice with pomegranate one or carrot juice with the beetroot juice in the proportion of 1:3

CONCLUSION

Daily intake of beetroot juice can provide you with a variety of health benefits. It contains a host of nutritional compounds like magnesium (Mg), phosphorus (P), sodium (Na), potassium (K) and calcium (Ca) and small amounts of copper (Cu), selenium (Se), zinc (Zn), iron (Fe) and manganese (Mn) as well. It can be consumed easily either cooked, or in salad or in the form of juice as one wishes too.

Some of the potential benefits of the wonder juice include: A cup of beetroot juice helps reduce blood pressure level. Drinking a glass of beetroot juice daily actually aids blood flow to the brain and halt age-related ailments like dementia. It is an amazing antioxidant and helps prevent the formation of cancerous tumors. Beetroot juice detoxifies the liver and also cures diseases of the digestive system. Beetroot juice could energize the elderly to lead more active lives as it widens blood vessels and reduces the amount of oxygen needed by muscles during physical activity. It is a very good source of folic acid and hence helps in providing protection against birth defects. And last, but certainly not the least, beet juice lowers bad cholesterol level. Treating blood pressure encompasses working on ways to reduce stress, eating healthy food choices, exercising, sand getting intake of the proper nutrients. Beetroot juice can be an excellent addition to a natural regimen designed to help bring blood pressure under control while increasing a person’s stamina and energy echelon.

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