

POTASSIUM

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Abstract

Potassium supplements have been explained since a time when many other minerals were not even known to be essential nutrients. Even though, there is still much more research required related to both the benefits as well as safety of potassium supplements. This chapter deals with overview of physiology, nutritional status assessment, Bioavailability from foods and supplements, typical intake versus needs, current research on supplement use, potassium and exercise performance, hypertension, kidney stone inhibition, osteoporosis inhibition, stroke inhibition, cramps, toxicity.

Introduction

Potassium is seen in bananas and it hampers cramps. A high potassium diet was treated as an antidote to high blood pressure. Some of indirect approaches are useful in estimating superoxide production and this will be applied to human studies of potassium intake.

Over View of Physiology:

Potassium behaves as the prime electrolyte inside cells and this electrolyte is pumped into cells where as Sodium is pumped out with the help of Na⁺ – K⁺ ATPase. The Sodium – Potassium gradient caused by this pump is responsible for an important function namely nerve impulse transmission. Normally only 2% of total body potassium is outside cells, with much of the cellular potassium retained in muscle cells. Therefore, total body potassium is approximately proportional to lean body mass. Various factors influence the movement of Potassium in and out of the cells including Insulin which throws Potassium into cells. Activation of the Sympathetic Nervous System (SNS) also influences potassium movement. β agonists enhance cellular uptake of potassium where as β blockers or activation by alpha agonists exhibit the opposite effect.. Plasma potassium can also be influenced by plasma pH. Acute metabolic acidosis enhances movement of out of whereas acute metabolic

alkalosis enhances movement of potassium into the cells. Whatever it may be, changes in plasma HCO_3^- concentration plays a major role compare to just PH chances. Fecal Potassium losses are fairly constant and very low (approximately 10% of intake). Normally in healthy kidneys urinary excretion is controlled to maintain balance . Whatever it may be, a large acute potassium load leads to the occurrence of 50% of the load to appear in the urine over several hours. A rise in plasma potassium is reduced by transferring most of the potassium load into cells. If elevated consumption continues, renal potassium excretion enhances, probably due to aldosterone secretion.⁴ In renal failure, an impairment of this process takes place and that is why potassium consumption is prevented in renal patients. During low Potassium consumption, potassium leaves cells, which indirectly regulates plasma concentrations.

Nutritional Status Assessment:

Specifically, serum or plasma potassium is helpful to estimate potassium nutrition status.^{4,7,8} These measures behave as a rough index to calculate body potassium stores, even though normal or even high values do not always eliminate some potassium depletion. ^{4,7} Severe potassium reduction is normally diagnosed by the combination of serum potassium readings and medical history as well as symptoms often linked with potassium depletion.^{4,8} If a severe depletion is expected, the root cause must be specifically needs to be ferreted out. So, the therapy involves both Potassium repletion and treating the root cause in a straight manner. Recording of repletion is performed by both serum potassium measures and evaluations linked with gross symptoms. Urinary potassium is also utilized specifically for considering short- term oral absorption of Potassium many sources.

Bio Availability from Foods and Supplements:

Potassium shows high water solubility and the absorption of potassium occurs very well even upto about 90%. Normally the absorption of potassium happens very well from most of the foods. For supplements, various complexes of potassium are available for oral or intravenous use. In many instances the molecule associated with the Potassium is treated as the main biological modulator, not potassium. In some other cases, some specific molecule is united with the potassium so that the complex consists of some specialized feature. For example, potassium is associated with chloride to have the taste property suitable as salt substitute for “shaker” use. In other cases, the binding molecule is selected to remove negative effects on certain medical instances. In the other cases, the binding molecule is not selected with a great deal of strategy. A very few experimental works have examined the absorption of certain

types of Potassium supplements and have observed the absorption to be very high. In some people, the types of encapsulation utilized for potassium supplement may regulate tendencies for GI tract irritation.

Typical Intake Various Needs:

It is very difficult to find a diet low or high in Potassium that does not exhibit many other positive or negative aspects. The concept that bananas are good source of potassium is not completely true. Complete to other foods, bananas consist of one of the higher potassium contents per serving. 15 On the other side, there are a good number of other foods almost equal or higher Potassium per serving. These other foods are such as other fruits and dairy products and even meats also. The potassium consumption from a single from a full diet stand point is good compare to from a single food stand point. Since many of foods consist of some potassium only diet does not influence severe potassium deficiencies if total food consumption is very low. Most cases of severe deficiency lead to the occurrence of potassium losses. There is some doubt as to what level of potassium consumption is optimal. According to a very few nutrition texts as well as internet Medical sites point out that Potassium consumption in the U.S. tends to be excellent except for justifying circumstances (example: the use of especially a very few diuretic drugs and some severe medical situations). These texts and sites normally do not encourage potassium supplementation unless prescribed by a physician. Compare to this attitude, there are popular press books as well as Internet sites reporting that many people in this country, particularly those with more sodium consumption s do not eat less than optional amounts of Potassium. Some have encouraged the side that tells all is generally well with potassium consumption, while other enhanced the possibility that enhanced consumption may assist a very few people.

Current Research on Supplement Use:

This topic is limited to application where potassium plays a major role particularly in chronic use. This will eliminate circumstances where potassium is administered by infusion or oral electrolyte solution to rectify acute electrolyte reductions in medical care instances. This also will eliminate applications suggested by a physician to deal with particularly drug side effects. A major example of the latter is to prevent the potassium- depleting effects of a very few diuretic drugs. Also eliminated from this chapter with the use of potassium chloride as a tablet salt substitute. To this author opinion, there is a little very information on salt substitutes that discriminate the effects of reduced sodium consumption versus those of enhanced Potassium consumption. After eliminating all these applications, the major

purposes of potassium supplements that have been given major importance by the general public and these supplements are given in Table 1.

Table: I

Areas of Major Correct Attentiveness for Potassium Supplementation:

- 1) Athletic/Exercise Performance Improvement
- 2) Hypertension
- 3) Kidney Stone Inhibition
- 4) Osteoporosis Impediments
- 5) Stroke Inhibition
- 6) Cramps

1) Potassium and Exercise Performance :

Potassium shows its effect on cramps and it plays a major role in muscle performance as well as fatigue particularly during exercise. This concept is derived from the metabolic perspective and not from the nutrition point of view. Many research papers indicate that the leakage of Potassium from muscle to serum especially during exercise beneficial in getting fatigue. 32.33 In spite of this research, there is next to research for a original studies of potassium consumption as exercise performance. In on exception, potassium phosphate supplement yields decreased effort perception particularly during exercise, but it is not transparent how much potassium, compare to the phosphate, beneficiary to the effect.³⁴ That is why in this author's belief, there is a necessity for new research particularly on exercise induced fatigue compare to potassium nutrition.

2) Hypertension:

Potassium influences blood pressure and is related to electrolyte movement. An indirect antioxidant efforts are observed earlier.³ Potassium can influence blood pressure and it does not mean that typical variation in potassium consumption exhibit a major influence on blood pressure in many people.

Some epidemiology experimental works exhibit an inverse relationship between blood pressure and potassium consumption or urinary potassium. Whatever it may be, it is not clear if this relationship follows original potassium effects of other positive aspects of diets that happen to be more in potassium. A statistically significant effect of potassium supplementation on blood pressure is shown. 20 This statistical analysis indicates that the effects seem to be greatest if sodium consumption is high. Another overview analysis also

indicates a statistically significant of potassium supplementation on blood pressure.²² A very few experimental studies of people with blood pressure in the normal range do not observe an effect on potassium supplementation.

Sustained Potassium supplementation may lower blood pressure in at least some people. Generally, even when drugs are utilized to rectify essential hyper tension, there is often the necessity to use more than one drug. Even though, enhancing potassium consumption may be a part of dietary as well as non dietary combination approach in stopping or reversing essential hyper tension. Regarding the diet component, in this author's opinion, high-Potassium foods may be superior to supplements for most people. One reason is that unlike the case for most minerals, typical potassium supplement regimens tend to not supply more potassium than a few servings of different foods. Whatever it may be high potassium diet may exhibit a variety of allots that could assist with blood pressure control. Dash diet for regulating blood pressure may be partly related to both high potassium content and other factors.

3) Kidney Stone Inhibition:

Potassium or magnesium citrate are useful in preventing Kidney stones in people prone to this problem. Epidemiological experimental research works also support the idea that low-potassium consumption enhances the risk of kidney stone formation in high risk subjects. Interpretation of these results can be confused by the fact that low-potassium diets may also have other features and influence stone formation. Finally, an inverse relationship between potassium and kidney stone formation tendencies is not settled, but possible.

4) Osteoporosis Inhibition:

The possible relationship has been suggested primarily for protection against a harmful effects of a high sodium diet. According to this plan, a high salt- diet changes calcium metabolism in a way that enhances osteoporosis risk, but this action is stopped by a high - potassium diet . Even though, a major contribution to osteoporosis risk of a high-salt diet is still a long way from confirmed, there is research work showing that four-weeks of more salt consumption enhances the rate of bone resorption in post menopausal women.

Some experimental research work, the effect of high salt diet was stopped by potassium citrate supplementation. There is also an epidemiological experimental work linking salt consumption and urinary calcium excretion. If these studies can be confirmed and expanded,

then in a very people, an anti osteoporosis value may be attributed for high potassium consumption via diet or supplementation.

Stroke inhibition

Potassium supplements can be used to reduce the risk off stroke inhibition. Still there are no experimental works of potassium supplementation and stroke. On the other side, there are epidemiology and animal studies, that enhance the possibility that potassium intake is related to stroke risk. Whatever it may be the results in human epidemiology studies are far from clean. For example, in one study, which examined different types of people, an association of dietary potassium consumption with the stroke mortality is observed only among black men under hypersensitive hypertensive men. In another experiment work, the possible effects of potassium are not easy to annoy out. The dietary potassium effect may need a combination with other dietary factors or may not originally occurs at all.

Cramps

Potassium deficiency leads to the occurrence of muscle cramps, if combined with muscle excretion. A connection holds for severe potassium deficiency as well as muscle tetany, which is potentially dangerous form of cramps. Astonishingly, in the list 35 years, very little study of this type of cramping and potassium is reported in the biomedical literature. Exercise induced cramping often happens independent of any role of potassium deficiency. Therefore, in this author's opinion, the role of potassium deficiency and repletion in the must common types of cramps remains largely not known. It is possible that potassium consumption could be a factor some of the time, but required hydration and physical approaches may be more useful. Consumption of potassium supplements are helpful in stopping common forms of cramps. Even if the food do not stop cramps, they still provide a excellent share of many nutrients and in many cases, a good deal of particularly phyto chemicals.

Toxicity

Heavy potassium leads to the occurrence of very dangerous condition because of potential cardiovascular effects as well as neuro muscular malfunctions. It is not very easy to reach toxic levels with the help of supplements for two causes.

- 1) Healthy kidneys can remove excess of orally ingested potassium.
- 2) Because of the low potassium dose per pill or capsule, many of these would have to taken to produce very high intakes. Normally, overdose of potassium is not frequently encountered in clinical practice except due to heavy retention during renal disease. A recent report

indicates two cases of poisoning in people consuming enormously high, single doses of sustained release potassium preparation.

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CONCLUSION:-

Potassium exhibits important functions but uncertainty is observed about optimal intake levels. Prescription supplements are responsible for treating a very few medical conditions. The best-studied application is for blood pressure, where it may assist some people, even though the benefit degree vary with varying circumstances and may work in a good manner if combined with other measures.