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This page is a small collection of papers dealing with magnesium deficiency. This is proving to be common in the population. If you take lots of zinc to lower your copper levels, then you better know that:**Zinc Supplementation Lowers Magnesium and Potassium Levels**..

Here is a quick summary:
1. Low magnesium affects numerous things, such as energy level, muscle spasms, personality, and higher risk of heart attack.
2. Taking zinc lowers magnesium levels
3. Lower magnesium levels automatically lowers potassium levels
4. You can increase potassium levels just by taking magnesium
5. Taking iron supplements has no effect on magnesium levels
6. Taking butyrate (tributyrin) raises slightly the absorption of magnesium

Summary: If you take a lot of zinc, you better be watching your magnesium.

In this interesting paper, the researchers actually experimented on people. Clearly low magnesium is a serious concern.

Experimental Human Magnesium Depletion

I. Clinical Observations and Blood Chemistry Alterations

MAURICE E. SHILS M.D., SC.D.1 1 From the Division of Experimental Surgery and Physiology, and the Andre and Bella Meyer Physiology Laboratory, Sloan-Kettering Institute for Cancer Research, and the Department of Medicine, Memorial and James Ewing Hospitals, New York, New York

Abstract:
Clinical and chemical changes are reported which have occurred in the course of a long term study on the effect of feeding a purified magnesium-deficient diet by tube to two elderly male subjects. Neither had significant gastrointestinal, renal, endocrine or other disease which might modify magnesium or other nutritional requirements.

In the initial depletion studies, plasma magnesium levels fell slowly but progressively for several months to levels approximately one-third to one-fourth the control levels and then stabilized. Red cell magnesium levels fell more slowly and after three months were two-thirds of normal.

In one subject symptoms and signs occurred after approximately a hundred days of depletion. These included personality changes, symptoms of gastrointestinal disturbance, gross tremor, fasciculations (muscle twitches http://en.wikipedia.org/wiki/Fasciculation) and hyporeflexia in the presence of positive Trousseau and Chvostek signs. These reverted to normal following the administration of magnesium salts and did not recur with continuation of the supplemented diet for another five months. In the second subject signs of paralytic ileus developed after fifty-five days of depletion in the first study, but only electromyographic changes in the second study which lasted for a period of thirty-eight weeks.

Despite an adequate calcium intake, serum calcium levels fell markedly in both subjects as the hypomagnesemia persisted. Hypokalemia developed and large additional intakes of potassium were required for maintenance of serum levels; this was correlated with decreased total exchangeable potassium.

In both subjects, serum calcium levels returned to normal following magnesium repletion, and serum potassium levels rose. In view of the hypocalcemia accompanying hypomagnesemia in these subjects and the **dramatic improvement with magnesium repletion, it is suggested that these two ions, as well as potassium, are intimately related in their metabolism.** Serial data on serum phosphorus, uric acid, cholesterol and proteins are presented.

When supplemented with magnesium and adequate absorbable iron, the purified diet utilized in this study is capable of maintaining weight and good general health over a prolonged period.

Low magnesium can cause serious behavioral issues:
"On day 107, definite behavioral changes were noticeable. The subject began to stay in bed much of the time, in marked contrast to his usual activity on the ward, and he changed from a friendly, outgoing and cooperative person to one who was apathetic, surly and uncooperative much of the time."

Lack Energy? Maybe It's Your Magnesium Level from the USDA

Taking zinc lowers magnesium levels

Inhibitory effects of zinc on magnesium balance and magnesium absorption in man.

Spencer H, Norris C, Williams D.

Metabolic Research and Research Service, Veterans Administration Hospital, Hines, IL 60141.

OBJECTIVE: Both zinc (Zn) and magnesium (Mg) are widely used as nutritional supplements and the possibility was considered that Zn may interfere with the absorption of Mg, similar to previously reported results [1,2] obtained with the same dose of supplemental Zn on the absorption of calcium (Ca). METHODS: Mg absorption studies and metabolic balances of Mg and of Zn were carried out in three groups of adult males in a metabolic research unit during the intake of supplemental doses of 142 mg Zn as Zn sulfate (ZnSO4) during Ca intakes of 230, 500 and 800 mg/day. RESULTS: The Zn intake of 142 mg/day decreased the Mg balance and Mg absorption only during the 500 mg Ca intake compared to control values. However, the overall effect of the high Zn intake of the three groups combined, regardless of the Ca intake, was a highly significant decrease of Mg absorption and of the Mg balance. CONCLUSION: **Zn supplements of 142 mg/day decreased Mg absorption and the Mg balance significantly during all Ca intakes for the three groups combined.**

Low potassium? Increase your magnesium.

Am J Med. 1987 Mar 20;82(3A):11-7.

Potassium/magnesium depletion in patients with cardiovascular disease.

Dyckner T, Wester PO.
Diuretic-induced deficiencies in potassium and magnesium can have significant implications for patients with cardiovascular disease. Hypokalemia, found in up to 50 percent of patients receiving thiazide therapy, is associated with a greater frequency of serious arrhythmias and increased mortality in patients with acute myocardial infarction. Hypomagnesemia has been identified in 42 percent of patients with hypokalemia, and below normal muscle magnesium levels have been found in 43 percent of congestive heart failure patients receiving diuretics. Magnesium is important for maintenance of cell potassium, and **infusions of magnesium alone have increased muscle potassium** and magnesium levels and significantly decreased the frequency of ventricular ectopic beats. It has been shown that both potassium and magnesium are conserved by potassium-sparing agents. Because serum and tissue magnesium levels are not correlated and correlations for potassium levels are weak, prevention of these electrolyte abnormalities is advised.

Oral magnesium supplementation takes time to act . Up to 6 months

1: J Intern Med. 1993 Feb;233(2):117-23

Oral magnesium supplementation restores the concentrations of magnesium, potassium and sodium-potassium pumps in skeletal muscle of patients receiving diuretic treatment.

Dørup I, Skajaa K, Thybo NK. Institute of Physiology, University of Aarhus, Denmark.

In 76 consecutive patients who had received diuretics for 1-17 years for arterial hypertension or congestive heart failure, muscle concentrations of magnesium, potassium, and sodium-potassium pumps were significantly reduced compared to 31 age- and sex-matched controls. Thirty-six patients with muscle magnesium and/or potassium below the control level received oral magnesium hydroxide supplement for 2-12 weeks (n = 20) or 26 weeks (n = 16). **After short-term (2-12 weeks) magnesium supplementation muscle parameters were increased, but far from normalized.** After magnesium supplementation for 26 weeks, the muscle concentrations of

magnesium, potassium and sodium-potassium pumps were normalized in most cases. Oral magnesium supplementation may restore diuretic-induced disturbances in the concentrations of magnesium, potassium and sodium potassium pumps in skeletal muscle. **A supplemental period of at least 6 months seems to be required before complete normalization can be expected.**

This article shows, besides Cisplatin causing low magnesium and potassium levels, that if you want to increase your potassium levels, you must do it by magnesium supplementation

Refractory potassium repletion due to cisplatin-induced magnesium depletion

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Cisplatin is a common cause of hypomagnesemia and hypokalemia due to renal magnesium (Mg) and potassium (K) losses. Magnesium plays an important role in the maintenance of intracellular K. An unrecognized and untreated Mg depletion can lead to a refractory K repletion. We describe two patients with hypomagnesemia-associated refractory hypokalemia following cisplatin following cisplatin therapy. **Potassium supplementation failed to replace the K deficit.** Profound **hypokalemia persisted until hypomagnesemia was recognized and corrected**. In neither patient was the concurrent hypomagnesemia recognized until the 11th and 9th hospital days. These two cases demonstrated the association of a refractory K repletion and an Mg deficiency. Thus, both serum K ion and Mg levels should routinely be assessed in patients who require cisplatin therapy.

Taking iron supplements does not increase magnesium levels

The effects of oral iron supplementation on zinc and magnesium levels during pregnancy

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Correspondence: T. Lind, Consultant Obstetrician, MRC Human Reproduction Group, Princess Mary Maternity Hospital, Newcastle upon Tync NE2 3BD.

Abstract
Summary. Serial changes in serum zinc and magnesium concentrations have been studied before conception, throughout pregnancy and at 12 weeks postpartum in 15 normal healthy women not receiving iron supplementation, 10 women receiving iron supplementation but other-wise having healthy pregnancies and five insulin-dependent diabetics who also received oral iron. Relative to pre-pregnancy values zinc concentrations progressively decreased throughout pregnancy reaching a nadir at 36 weeks gestation followed by an increase; pre-pregnancy values were achieved by 12 weeks postpartum. Magnesium concentrations also decreased throughout pregnancy reaching a nadir at 32 weeks gestation increasing thereafter again with pre-pregnancy values achieved by 12 weeks postpartum. Iron supplementation in non-diabetic and diabetic women had no significant effect upon the changes in serum concentration of either zinc or magnesium. These results suggest that the decrease in the concentrations of both elements is a normal physiological adjustment to pregnancy and that **iron supplementation does not influence these changes.**

Butyrate stimulates absorption. So butyrate / tributyrin is ok and does not lower magnesium

Effects of short chain fatty acids and K on absorption of Mg and other cations by the colon and caecum

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Received: 20 July 1990

Summary The influence of short chain fatty acids (SCFA) on Mg, Na, and water absorption was studied in the rat distal colon and caecum using an in vivo luminal perfusion technique. The effect of SCFA on K absorption by the distal colon and the effect of K on Mg absorption by the distal colon and caecum were also investigated.

Butyrate (60 mmol/l) or a mixture of SCFA (60 mmol/l acetate, 20 mmol/l propionate, 10 mmol/l butyrate) stimulated Mg and K absorption by the distal colon, while Na and water absorption was not affected. The effect on Mg absorption was pH-dependent. In the caecum, butyrate enhanced Na and water absorption, but not Mg absorption. Acetate (60 mmol/l) did not influence electrolyte absorption by either intestinal segment. K (30 mmol/l) inhibited Mg absorption by the distal colon, but not by the caecum.

It is concluded from these findings that SCFA deriving from fermentation of carbohydrates in the large intestine stimulate Mg, K, and Na absorption by delivering protons to Mg++/H+, K+/H+ and Na+/H+ exchangers located in the apical membrane of the epithelium. K seems to inhibit Mg absorption in the colon by affecting a mechanism which does not respond to SCFA.

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