THE DOSAGE OF THE IONS OF MAGNESIUM IN THE MILK

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Abstract

Magnesium, an abundant mineral in the body, is naturally present in many foods, added to other food products, available as a dietary supplement, and present in some medicines (such as antacids and laxatives). This paper intends to determine the concentration of the ions of magnesium in the milk from three different sources: from the dispenser market, from the supermarket and directly from country.

Key words: magnesium, milk, titrimetric method, spectophotometric method

INTRODUCTION

Magnesium is a cofactor in more than 300 enzyme systems that regulate diverse biochemical reactions in the body, including protein synthesis, muscle and nerve function, blood glucose control, and blood pressure regulation (Rude RK , 2010 Rude RK 2012) , Magnesium is required for energy production, oxidative phosphorylation, and glycolysis. It contributes to the structural development of bone and is required for the synthesis of DNA, RNA, and the antioxidant glutathione. Magnesium also plays a role in the active transport of calcium and potassium ions across cell membranes, a process that is important to nerve impulse conduction, muscle contraction, and normal heart rhythm(Volpe SL, 2012).Assessing magnesium status is difficult because most magnesium is inside cells or in bone (Th Elin RJ,2010) e most commonly used and readily available method for assessing magnesium status is measurement of serum magnesium concentration, even though serum levels have little correlation with total body magnesium levels or concentrations in specific tissues.

Symptomatic magnesium deficiency due to low dietary intake in otherwise-healthy people is uncommon because the kidneys limit urinary excretion of this mineral. However, habitually low intakes or excessive losses of magnesium due to certain health conditions, chronic alcoholism, and/or the use of certain medications can lead to magnesium deficiency.(Rude RK, Singer FR, Gruber HE,2009)

Early signs of magnesium deficiency include loss of appetite, nausea, vomiting, fatigue, and weakness. As magnesium deficiency worsens, numbness, tingling, muscle contractions and cramps, seizures, personality changes, abnormal heart rhythms, and coronary spasms can occur . Severe

magnesium deficiency can result in hypocalcemia or hypokalemia (low serum calcium or potassium levels, respectively) because mineral homeostasis is disrupted .

Magnesium supplements are available in a variety of forms, including magnesium oxide, citrate, and chloride . The Supplement Facts panel on a dietary supplement label declares the amount ofelemental magnesium in the product, not the weight of the entire magnesium-containing compound.(Ranade VV, Somberg JC.)

Absorption of magnesium from different kinds of magnesium supplements varies. Forms of magnesium that dissolve well in liquid are more completely absorbed in the gut than less soluble forms . (Ranade VV, Somberg JC ,2001). Small studies have found that magnesium in the aspartate, citrate, lactate, and chloride forms is absorbed more completely and is more bioavailable than magnesium oxide and magnesium sulfate . One study found that very high doses of zinc from supplements (142 mg/day) can interfere with magnesium absorption and disrupt the magnesium balance in the body.(Spencer H, Norris C, Williams D.,1994)

MATERIAL AND METHOD

The dosage of the ions of magnesium from the milk was carried out with the help of a complexometric titration with a volumetric solution of complexon III 0,01 M (F=1,000) in present of the indicator Black Eriocrom T of pH=10 with ammoniacal tampon.

Equivalence point was determinated by color change from violet to blue.

Reagents: Ammonium chloride (Merk)
Ammonium hydroxide (Chimopar)
Complexon III (MerK)
Black Eriocrom (Merk)

Another method of dosing magnesium is spectophotometric.

Principle of the method: magnesium forms a coloured complex when reacts with Magon sulfonate in alkaline solution. The intensity of the color formed is proportional to the magnesium concentration in the sample.

Reagents: Xylidyl Blue 0.1mmol/L
Thioglycolic acid 0.7 mmol/L
DMSO 3000mmol/L
Magnesium aqueous primary standard 2 mg/dL

Preparation: the reagents and standard are ready to use

Additional equipment: spectrophotometer Hitachi 917 mesuring at 546 nm
Matched cuvettes 1.0 cm light path

Procedure:

Assay conditions:

- Wavelength: 546 nm
- Cuvette 1 cm light path
- Temperature: 37℃
- Adjust the instrument to zero with distilled warter
- Pipette into a cuvette:

	Blank	Standard	Sample
R (mL)	1.0	1.0	1.0
Standard (µL)	------	10	-----
Sample (µL)	-----	-----	10

- Mix and incubate for 3 min a 37℃
- Read the absorbance (A) of the samples and calibrator, against the Blank. The colour is stable for at least 30 minutes.

RESULTS AND DISSCUSIONS

In the situation of titration of dosage, more exactly, we weigh each 10 mL sample is added 50 mL deionized water and titrate with volumetric solution of complexon III to turn indicator.

The consumption volumes for the three samples analyzed and the amount of magnesium ions reported ad 10 mL sample respectively 100 mL sample are presented in the following table:

Table 1

The consumption volumes for the three samples analyzed and the amount of magnesium ions reported ad 10 mL sample respectively 100 mL sample

Crt. Nb.	Sample	Sample quantity, mL	V CIII consumed (mL)	mg Mg^{2+}/10mL sample	mg Mg^{2+}/100mL sample
1	Country	10	4.16	1.00	10
2	Supermarket	10	4.5	1.08	10.8
3	Dispenser market	10	5	1.2	12

In the situation of spectophotometrc of dosage, calculation of magnesium is:

$$\text{mg/dL magnesium in the sample} = \frac{(A)\text{Sample} - (A)\text{Blank}}{(A)\text{Standard} - (A)\text{Blank}} \times 2 \text{ (Standard conc.)}$$

Table 2

Magnesium concentration (mg/dL)

Sample	Magnesium concentration (mg/dL)
Country	10.2
Supermarket	10.8
Dispenser market	11.9

CONCLUSIONS

The milk is a good source of magnesium which is important for health.
The concentrations obtained using titrimetric method and spectophotometric test indicating a higher concentration of magnesium in the milk wich derived from the dispenser market, followed by the supermarket and the country.

The milk wich derived from the country has o lower concentration in magnesium probably due the influence of the animals nutrition in this part of the year.

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