Magnesium

DiaSystem Scandinavia AB

Diagnostic reagent for quantitative in vitro determination of magnesium in serum, plasma, cerebrospinal fluid or urine on photometric systems

Order Information

Cat. No.	Kit size
01 00034 70 04 0125 CDT-Mg	R: 5 x 25 mL R: 4 x 30 mL
06 00110 70 04 0018	Magnesium Standard 6x3 mL

Summary

Deficiency of magnesium is a quite common disorder which can be caused by malnutrition, malabsorption, renal loss and endocrinological disturbances. Complications associated with decreased magnesium concentrations are neuromuscular irritability (e.g. tremor, seizures) and cardiac symptoms (e.g. tachycardia, arrhythmia). Decreased magnesium concentrations are often related to decreased calcium and potassium levels, taking into account that hypomagnesemia may be the primary cause of hypocalcemia. Elevated magnesium values can be observed in dehydration, renal disorders and after intake of excessive amounts of antacids and can be associated with weakness of reflexes and low blood pressure [1,2].

Method

Photometric test using xylidyl blue.

Principle

Magnesium ions form a purple colored complex with xylidyl blue in alkaline solution. In presence of GEDTA, which complexes calcium ions, the reaction is specific. The intensity of the purple color is proportional to the magnesium concentration.

Reagents

Components and Concentrations

Reagent:		
Ethanolamine	pH 11.0	750 mmol/L
GEDTA (Glycoletherdiamine-tetraacetic acid)		60 µmol/L
Xylidyl blue		110 µmol/L
Standard:		2 mg/dL (0.82 mmol/L)

Storage Instructions and Reagent Stability

Reagent and standard are stable up to the end of the indicated month of expiry, if stored at 2 – 8°C and contamination is avoided. Do not freeze the reagent! Protect the standard from light!

Warnings and Precautions

1. Reagent: Danger. H315 Causes skin irritation. H318 Causes serious eye damage. P264 Wash hands and face thoroughly after handling. P280 Wear protective gloves/protective clothing/eye protection. P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P310 Immediately call a poison center or doctor/physician.
2. In very rare cases, samples of patients with gammopathy might give falsified results [8].
3. 3. Please refer to the safety data sheets and take the necessary precautions for the use of laboratory reagents. For diagnostic purposes, the results should always be assessed with the patient's medical history, clinical examinations and other findings.
4. For professional use only!

Waste Management

Please refer to local legal requirements.

Reagent Preparation

The reagent and the standard are ready to use.

Materials required but not provided

NaCl solution 9 g/L
General laboratory equipment

Specimen

Serum, plasma, cerebrospinal fluid (CSF) or urine
Do not use EDTA plasma.

Stability [3]:

in serum/plasma:	7 days	at	20 - 25 °C
	7 days	at	4 - 8 °C
	1 year	at	-20 °C
in urine:	3 days	at	20 - 25 °C
	3 days	at	4 - 8 °C
	1 year	at	-20 °C

Acidify urine with some drops of conc. HCl to pH 3-4, then dilute 1+4 with dist. water; multiply the result by 5.
Freeze only once!
Discard contaminated specimens!

Assay Procedure

Application sheets for automated systems are available on request.

Wavelength	520 nm, Hg 546 nm, 500 - 550 nm (Increase of absorbance) 628 nm, Hg 623 nm, 570 - 650 nm (Decrease of absorbance)
Optical path	1 cm
Temperature	20 - 25 °C/37 °C
Measurement	Against reagent blank

	Blank	Sample or standard
Sample or standard	-	10 µL
Dist. water	10 µL	-
Reagent	1000 µL	1000 µL

Mix and read absorbance against blank after 5-60 min at 20 – 25 °C/37 °C.

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Calculation

With standard or calibrator

$$\text{Magnesium [mg/dL]} = \frac{A\ \text{Sample}}{A\ \text{Std./Cal}} \times \text{Conc. Std./Cal. [mg/dL]}$$

Conversion factor

Magnesium [mg/dL] x 0.4114 = Magnesium [mmol/L]

Calibrators and Controls

For the calibration of automated photometric systems the DiaSystem UniCal CC is recommended. The assigned values of the calibrator have been made traceable to the reference method Atomic Absorption Spectrometry (AAS). DiaSystem UniLab N and DiaSystem UniLab P or UniLab Urine controls should be assayed for internal quality control. Each laboratory should establish corrective actions in case of deviations in control recovery.

	Cat.-No.	Kit size
UniCal CC	06 00122 70 04 0018	6 x 3 mL
UniLab N	07 00123 70 05 0030	6 x 5 mL
UniLab P	07 00124 70 05 0030	6 x 5 mL
UniLab Urine Level 1	07 00125 70 04 0030	6 x 5 mL
UniLab Urine Level 2	07 00126 70 04 0030	6 x 5 mL

Performance Characteristics

Measuring range

The test has been developed to determine magnesium concentrations within a measuring range from 0.05 - 5 mg/dL (0.02 – 2.05 mmol/L). When values exceed this range samples should be diluted 1+4 with NaCl solution (9 g/L) and the result multiplied by 5.

Specificity/Interferences

No interference was observed by ascorbic acid up to 30 mg/dL, bilirubin up to 40 mg/dL, lipemia up to 2,000 mg/dL triglycerides and calcium up to 25 mg/dL. Hemoglobin interferes because magnesium is released by erythrocytes. For further information on interfering substances refer to Young DS [7].

Sensitivity/Limit of Detection

The lower limit of detection is 0.05 mg/dL (0.02 mmol/L).

Precision (at 37 °C)

Intra-assay n = 20	Mean [mg/dL]	SD [mg/dL]	CV [%]
Sample 1	1.88	0.02	0.92
Sample 2	2.34	0.02	0.87
Sample 3	4.02	0.03	0.83

Inter-assay n = 20	Mean [mg/dL]	SD [mg/dL]	CV [%]
Sample 1	1.84	0.02	1.09
Sample 2	2.38	0.03	1.12
Sample 3	4.11	0.06	1.43

Method Comparison

A comparison of DiaSystem Magnesium (y) with a commercially available test (x) using 81 samples gave following results: y = 1.01 x – 0.03 mg/dL; r= 0.999.

Reference Range [1,6]

Serum / Plasma:

Neonates	1.2 – 2.6 mg/dL	(0.48 – 1.05 mmol/L)
Children	1.5 – 2.3 mg/dL	(0.60 – 0.95 mmol/L)
Women	1.9 – 2.5 mg/dL	(0.77 – 1.03 mmol/L)
Men	1.8 – 2.6 mg/dL	(0.73 – 1.06 mmol/L)
Urine:	73 – 122 mg/24 h	(3 – 5 mmol/24 h)
CSF:	2.1 – 3.3 mg/dL	(0.85 – 1.35 mmol/L)

Each laboratory should check if the reference ranges are transferable to its own patient population and determine own reference ranges if necessary.

Literature

1. Thomas L. Clinical Laboratory Diagnostics. 1st ed. Frankfurt: TH-Books Verlagsgesellschaft; 1998. p. 231-41.
2. Endres DB, Rude RK. Mineral and bone metabolism. In: Burtis CA, Ashwood ER, editors. Tietz Textbook of Clinical Chemistry. 3rd ed. Philadelphia: W.B Saunders Company; 1999. p. 1395-1457.
3. Guder WG, Zatwa B et al. The quality of Diagnostic Samples. 1st ed. Darmstadt: Git Verlag, 2001: 38-39, 50-51.
4. Mann CK, Yoe JH. Spectrophotometric determination of magnesium with 1-Azo-2-hydroxy-3-(2.4-dimethylcarboxanilido)-naphthalene-1'-(2-hydroxybenzene). Anal Chim Acta 1957; 16: 155-60.
5. Bohoun C. Microdosage du magnesium dans divers milieux biologiques. Clin Chim Acta 1962; 7:811-7.
6. Sitzmann FC. Normalwerte. München: Hans Marseille Verlag GmbH: 1986. p. 166.
7. Young DS. Effects of Drugs on Clinical Laboratory Tests. 5th ed. Volume 1 and 2. Washington, DC: The American Association for Clinical Chemistry Press 2000.
8. Bakker AJ, Mücke M. Gammopathy interference in clinical chemistry assays: Mechanisms, detection and prevention. Clin Chem Lab Med 2007; 45(9): 1240–1243

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