COD 11797 4 x 50 mL
STORE AT 2-8ºC
Reagents for measurement of magnesium concentration Only for *in vitro* use in the clinical laboratory

MAGNESIUM

CE

BioSystems
REAGENTS & INSTRUMENTS

MAGNESIUM
XYLIDYL BLUE

PRINCIPLE OF THE METHOD

Magnesium in the sample reacts with xylidyl blue in alkaline medium forming a coloured complex that can be measured by spectrophotometry. EGTA is included in the reagent to remove calcium interference[1,2].

CONTENTS AND COMPOSITION

A. Reagent. 4 x 40 mL. Sodium carbonate 0.1 mol/L EGTA 0.1 mmol/L, triethanolamine 0.1 mol/L, potassium cyanide 7.7 mmol/L, sodium azide 0.95 g/L.

DANGER: H314: Causes severe skin burns and eye damage. P280: Wear protective gloves/protective clothing/eye protection/face protection. P303+P361+P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

B. Reagent. 4 x 10 mL. Glycine 25 mmol/L, xylidyl blue 0.5 mmol/L, chloroacetamide 2.6 g/L.

WARNING: H317: May cause an allergic skin reaction. P302+P352: IF ON SKIN: Wash with plenty of soap and water. P333+P313: If skin irritation or rash occurs: Get medical advice/attention.

S. Calcium/Magnesium Standard. 1 x 5 mL. Calcium 10 mg/dL, magnesium 2 mg/dL (0.82 mmol/L). Aqueous primary standard.

For further warnings and precautions, see the product safety data sheet (SDS).

STORAGE

Store at 2-8ºC.

Reagents and Standard are stable until the expiry date shown on the label when stored tightly closed and if contaminations are prevented during their use.

Indications of deterioration:

– Reagents: Presence of particulate material, turbidity, absorbance over 0.575 at 520 nm (1 cm cuvette).

– Standard: Presence of particulate material, turbidity.

REAGENT PREPARATION (Note 1)

Working Reagent: pour the contents of the Reagent B into the Reagent A bottle. Mix gently. Other volumes can be prepared in the proportion: 4 mL Reagent A + 1 mL Reagent B. Stable for 15 days at 2-8ºC.

Standard is provided ready to use.

ADDITIONAL EQUIPMENT

– Analyzer, spectrophotometer or photometer with cell holder able to read at 520 ± 20 nm.

SAMPLES

Serum, plasma or urine collected by standard procedures. Hemolysed and lipemic samples are not suitable for testing.

Magnesium in serum or plasma is stable for 10 days at 2-8ºC. Use heparin as anticoagulant.

Collect 24-hour urine in a bottle containing 10 mL of 10% (v/v) hydrochloric acid. Stable for 1 week at 2-8ºC. Centrifuge or filter the sample and dilute 1/5 with distilled water before measurement.

PROCEDURE

1. Bring the Working reagent to room temperature.
2. Pipette into labelled test tubes: (Notes 1, 2)

	Blank	Standard	Sample
Magnesium Standard (S)	—	10 µL	—
Sample	—	—	10 µL
Working reagent	1.0 mL	1.0 mL	1.0 mL

3. Mix thoroughly and let stand the tubes for 2 minutes at room temperature.
4. Read the absorbance (A) of the Standard and the Sample at 520 nm against the Blank. The colour is stable for at least 1 hour.

CALCULATIONS

The magnesium concentration in the sample is calculated using the following general formula:

$$\frac{A_{Sample}}{A_{Standard}} \times C_{Standard} = C_{Sample}$$

If the Magnesium Standard provided has been used to calibrate (Note 2):

$\frac{A_{Sample}}{A_{Standard}}$	x 2 = mg/dL magnesium x 0.82 = mmol/L magnesium

REFERENCE VALUES

Serum and plasma[3]: 1.7-2.4 mg/dL = 0.70-0.98 mmol/L.

Urine[3]: 72.9-122 mg/24-h = 3-5 mmol/24-h.

These ranges are given for orientation only; each laboratory should establish its own reference ranges.

QUALITY CONTROL

It is recommended to use the Biochemistry Control Serum level I (cod. 18005, cod. 18009 and cod. 18042), level II (cod. 18007, cod. 18010 and cod. 18043) and the Biochemistry Control Urine (cod. 18054 and cod. 18066) to verify the performance of the measurement procedure.

Each laboratory should establish its own internal Quality Control scheme and procedures for corrective action if controls do not recover within the acceptable tolerances.

METROLOGICAL CHARACTERISTICS

– Detection limit: 0.11 mg/dL = 0.04 mmol/L.

– Linearity limit: 4 mg/dL = 1.64 mmol/L. For higher values dilute sample 1/2 with distilled water and repeat measurement.

– Repeatibility (within run):

Mean Concentration	CV	n
1.24 mg/dL = 0.51 mmol/L	2.1 %	20
2.65 mg/dL = 1.09 mmol/L	2.2 %	20

– Reproducibility (run to run):

Mean Concentration	CV	n
1.24 mg/dL = 0.51 mmol/L	2.2 %	25
2.65 mg/dL = 1.09 mmol/L	2.5 %	25

– Sensitivity: 109 mA·dL/mg = 265 mA·L/mmol.

– Trueness: Results obtained with this reagent did not show systematic differences when compared with reference reagents (Note 3). Details of the comparison experiments are available on request.

– Interferences: Bilirubin (20 mg/dL) do not interfere. Lipemia (triglycerides 3.75 g/L) and hemolysis (hemoglobin 5 g/L) may affect the results. Other drugs and substances may interfere[4].

These metrological characteristics have been obtained using an analyzer. Results may vary if a different instrument or a manual procedure is used.

DIAGNOSTIC CHARACTERISTICS

Magnesium is one of the most abundant cations in the body. It is stored mainly in bone but significant amounts are contained in gastric and biliary secretions. Magnesium acts as an essential cofactor for enzymes concerned with cell respiration, glycolisis, and transmembrane transport of other cations.

Plasma magnesium concentration is normally kept within narrow limits. The kidneys are the main organs of magnesium homeostasis in maintaining plasma concentrations.

Increased serum magnesium concentrations have been observed in dehydration, severe diabetic acidosis, Addison's disease, and conditions that interfere with glomerular filtration[3,5].

Low magnesium concentration in plasma is found as a result of gastrointestinal malabsorption, fluid losses, renal losses caused by diuretic therapy and aminoglucoside therapy. It also may be due to hypoparathyroidsm and alcoholism[3,5].

Clinical dianosis should not be made on the findings of a single test result, but should integrate both clinical and laboratory data.

NOTES

1. Contamination of glassware with magnesium will affect the test. Use acid-washed glassware or plastic tubes.
2. The reagent may be used in several automated analyzers. Instructions for many of them are available on request.
3. Calibration with the provided aqueous standard may cause a matrix related bias, specially in some analyzers. In these cases, it is recommended to calibrate using a serum based standard (Biochemistry Calibrator, cod. 18011 and 18044).

BIBLIOGRAPHY

1. . Barbour HM and Davisdon W. Studies on measurement of plasma magnesium: application of the Magon dye method to the "Monarch" centrifugal analyzer. Clin Chem 1988; 34/10: 2103-2105.
2. Chromýa V, , Svoboda V, and Štěpánová I. Spectrophotometric determination of magnesium in biological fluids with xylidyl blue II. Biochem Med 1973, 7/2: 208-217.
3. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 4th ed. Burtis CA, Ashwood ER, Bruns DE. WB Saunders Co, 2005.
4. Young DS. Effects of drugs on clinical laboratory tests, 5th ed. AACC Press, 2000.
5. Friedman and Young. Effects of disease on clinical laboratory tests, 4th ed. AACC Press, 2001.