

Magnesium Reagent

INTENDED USE

For the quantitative determination of magnesium in serum.

SUMMARY

Magnesium is a major intracellular cation. Approximately one-half of the body magnesium is present in the bone. Most of the remainder is found in soft tissues.¹ Little is known about the factors regulating magnesium levels in plasma. It is believed that the parathyroid gland may be involved.²

Magnesium ions serve as activators for a number of important enzyme systems engaged in the transfer and hydrolysis of phosphate groups, such as hexokinase, creatine kinase, alkaline phosphatase, and prostatic acid phosphatase.¹

Decreased serum magnesium levels have been observed in cases of diabetes, alcoholism, hyperthyroidism, hypoparathyroidism, malabsorption, hyperalimentation, myocardial infarction, congestive heart failure, and liver cirrhosis. Increased serum magnesium levels have been found in cases of renal failure, severe diabetic acidosis, and Addison's disease.^{1,2}

The determination of magnesium in serum has been impeded by technical difficulties. A simple, rapid, and reliable method is needed to serve as an alternative to atomic absorption spectrophotometry which is the best method for the assay of magnesium. But, atomic absorption requires expensive instrumentation and a large sample. The Thermo Magnesium Procedure is a direct method in which magnesium forms a colored complex with magon in a strongly basic solution, where calcium and protein interference is eliminated.²

METHODOLOGY

$Mg^{2+} + \text{magon} \rightarrow \text{colored complex}$

Magnesium forms a colored complex with magon in a strongly alkaline solution. The reagents have been optimized to eliminate calcium and protein interference. The color produced is measured spectrophotometrically and is proportional to the magnesium concentration.²

REAGENTS

Reactive Ingredients

Magnesium Color (R1)

magon sulfonate	0.125 mmol/L
buffer	
surfactant	

Magnesium Base (R2)

PRECAUTIONS

For in vitro diagnostic use.

Magnesium Color Reagent (R1) is toxic. Do not inhale vapors for any prolonged period of time. In case of contact, wash with copious amounts of water. Do not ingest.

Magnesium Base Reagent (R2) is caustic. Exercise great care in handling. In case of contact, wash with copious amounts of water. Do not ingest.

PREPARATION

Magnesium Reagents are ready to use as supplied.

STORAGE AND STABILITY

1. The unopened reagents are stable until the expiration date stated on the label when stored at 2° - 30°C.
2. After opening the reagents are stable for 14 days when stored at 2° - 15°C and kept covered.

DETERIORATION

1. Magnesium Color (R1) should be a dark blue solution.
2. Magnesium Base (R2) should be a clear and colorless solution.
3. Failure to achieve assay values on freshly prepared control sera could indicate deterioration.

SPECIMEN COLLECTION

Non-hemolyzed serum is the recommended sample. Separate from clot as soon as possible.¹

SAMPLE STORAGE

Magnesium in serum is stable for several days if the serum is stored at 2° - 8°C. separated from the red cells.¹

INTERFERING SUBSTANCES

1. It is important that hemolysis be avoided since the concentration of magnesium in red cells is substantially greater than the serum concentration.²
2. Moderately elevated bilirubin does not cause significant interference with this assay.
3. Lipemia will cause interference with this assay.
4. Young has reviewed drug effects on serum magnesium levels.³

PROCEDURE

Test Parameters

Refer to the Thermo Reagent Applications.

MATERIALS PROVIDED

Each component is sold separately.

1. 7500-121 Magnesium Color (R1) 4 x 250 mL
2. 7500-221 Magnesium Base (R2) 4 x 250 mL

MATERIALS REQUIRED BUT NOT PROVIDED

1. Analyzer with Manual and Accessories.
2. Thermo Reagent Applications.
3. Thermo Data-Cal (Cat. No.1905-505 or TR43001) or equivalent.
4. Thermo Data-Trol N and Data-Trol A (Cat. No.1902-050 or TR40001 and 1901-050 or TR41001) or equivalent.

STABILITY OF FINAL REACTION MIXTURE

The instrument automatically computes every determination at the same time interval.

CALIBRATION

Thermo Data-Cal (Cat. No. 1905-505 or TR43001) or equivalent should be used to calibrate the instrument.

LINEARITY

Linearity extends to 5.0 mEq/L. Samples exceeding linearity should be diluted with normal saline and repeated. Multiply the result by the dilution factor when calculating the unknown.

QUALITY CONTROL

Normal and abnormal control sera of known concentrations of magnesium should be analyzed routinely with each group of unknown samples. Thermo's Data-Trol N and Data-Trol A (Cat. No. 1902-050 or TR40001 and 1901-050 or TR41001) are recommended for this purpose.

CALCULATION OF RESULTS

Results, expressed as mEq/L at 37°C, are automatically calculated.

NOTE: If it is necessary to report magnesium in mg/dL instead of mEq/L multiply the mEq/L value by 1.215 to obtain magnesium mg/dL

LIMITATIONS

See Storage and Stability, Deterioration, Specimen Collection, Interfering Substances, Sample Storage, and Linearity sections for limitations to this procedure.

EXPECTED VALUES

An observed range for magnesium, derived from a study of 51 asymptomatic adults in the Southwest, was found to be 1.7 - 2.3 mEq/L. A reference range of 1.3 - 2.1 mEq/L has been reported in the literature.⁴ These ranges should serve only as guidelines. It is recommended that each laboratory establish its own range of expected values, since differences exist between laboratories and local populations.

PERFORMANCE CHARACTERISTICS

Precision

Within-run precision was determined by assaying control sera in replicate.

Within-run	n	Mean	Std.Dev.	CV%
Level 1	20	1.3	0.04	3.08
Level 2	20	2.4	0.02	0.83
Level 3	20	4.3	0.04	0.93

Run-to-run precision was determined by assaying control sera in duplicate for 10 runs.

Run-to-run	n	Mean	Std.Dev.	CV%
Level 1	20	1.3	0.06	4.62
Level 2	20	2.3	0.06	2.61
Level 3	20	4.3	0.10	2.33

SENSITIVITY

Based on an instrument resolution of A = 0.001, this Thermo Magnesium Procedure has a sensitivity of 0.01 mEq/L

REFERENCES

1. Tietz, N.W., Fundamentals of Clinical Chemistry. W.B. Saunders Co., Philadelphia, 1976, p. 917-919.
2. Faulkner, W.R., Selected Methods for the Small Clinical Chemistry Laboratory, AACC, Washington, D.C., 1982, p. 277-280.
3. Young, D.S., Effects of Drugs on Clinical Laboratory Tests. 3rd ed., AACC Press, Washington, D.C., 1990, p. 3-237 — 3-239.
4. Tietz, N.W., Clinical Guide to Laboratory Tests. W.B. Saunders Co., Philadelphia, 1983, p. 338.

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REF

Reorder Information

Catalogue No.	Configuration
7500-121	4 x 250 mL Color (R1)
7500-221	4 x 250 mL Base (R2)