

# Magnesium Reagent

Catalog #: 43719

for use with the

## SDI CA480 Clinical Chemistry System

### INTENDED USE

For the *in vitro* quantitative determination of magnesium in serum.

### CLINICAL SIGNIFICANCE

Magnesium in the body is found primarily in bone with some in soft tissue, blood cells, and serum. Decreased levels have been observed in cases of diabetes, alcoholism, diuretics, hyperthyroidism, hypothyroidism, malabsorption, hyperalimination, myocardial infarction, congestive heart failure and liver cirrhosis. Increased serum magnesium levels have been found in renal failure, diabetic acidosis, Addison's disease, and vitamin D intoxication.

### METHODOLOGY

Serum magnesium measurement was first introduced in that 1920's with the laborious precipitation procedures of Kramer and Tisdall<sup>1</sup>, Briggs<sup>2</sup>, and Denis<sup>3</sup>. These were followed by a variety of methods including: complexometric EDTA titration procedures<sup>4</sup>, fluorometric procedures involving chelates of magnesium<sup>5,6</sup>, and a dye absorption method based on the reaction of Titan Yellow with magnesium hydroxide to form a red-colored lake<sup>7</sup>. Each of these procedures suffered from numerous technical difficulties which greatly affected the accuracy and precision of their results.

Atomic absorption remains the most accurate method for magnesium determinations. However, this method requires expensive instrumentation and uses large sample volumes which limit its usefulness for pediatric testing<sup>8</sup>.

More recently, colorimetric dye-complexing methods have been developed and are in popular use. These procedures use such dyes as Calmagite, Eriochrome Black T, Magon, and methylthymol blue<sup>9</sup>.

The SDI Magnesium uses an Arsenazo dye which binds preferentially with magnesium. The absorbance of the Arsenazo Magnesium complex is measured at 570 nm and is proportional to the concentration of magnesium present in the sample. Calcium interference is prevented by incorporation of an unconventional calcium chelating agent.

### REAGENT COMPOSITION

Active Ingredients	Concentration
Tris Buffer	100 mM
Arsenazo Dye	0.13 mM
Chelating Agent	0.31 mM

pH 9.8

### Precautions:

1. This reagent is for *in vitro* diagnostic use only.
2. Do not pipette by mouth. Avoid contact with skin and clothing.

### REAGENT PREPARATION

Reagent is supplied ready to use.

### REAGENT STORAGE

1. Store reagent between 2-25°C.
2. The reagent is stable until the expiration date stated on the label.

### REAGENT DETERIORATION

Do not use reagent if:

1. Working reagent fails to achieve established values of fresh control sera.
2. Working reagent becomes visibly turbid.
3. Reagent has an absorbance greater than 0.70 when measured against water at 570 nm.

### SPECIMEN COLLECTION AND STORAGE

1. Use fresh, unhemolyzed serum.
2. Red cells contain twice the magnesium concentration as serum. A hemolyzed sample would falsely elevate results.<sup>10</sup>
3. Grossly icteric or lipemic specimens should not be used in this method.

### INTERFERENCES

Studies to determine the level of interference for hemoglobin, bilirubin, and lipemia were carried out, the following results were obtained:

#### Hemoglobin:

No significant interference from hemoglobin up to 200 mg/dL.

#### Bilirubin:

No significant interference from bilirubin up to 15 mg/dL.

#### Lipemia:

No significant interference from lipemia up to 930 mg/dL measured as triglycerides.

Hemolyzed, grossly icteric or lipemic should not be used.

A number of drugs and substances affect the concentration of magnesium. See Young, et al.<sup>11</sup>

### ADDITIONAL EQUIPMENT REQUIRED BUT NOT PROVIDED

1. SDI CA480 Clinical Chemistry System.
2. Deionized water and related equipment, e.g.: pipettes
3. Analyzer specific consumables, e.g.: sample cups
4. Control, and Calibrator materials such as those provided by SDI Biomed.

### ASSAY PROCEDURE

#### System Parameters

Magnesium	
TEMPERATURE:	37°C
WAVELENGTH:	570 nm
ASSAY TYPE:	Endpoint
DIRECTION:	Increase
SAMPLE / RGT RATIO:	1 : 60
e.g. Sample Vol.	0.025 mL (25mL)
Reagent Vol.	1.5 mL
INCUBATION TIME:	1 Min

#### Procedure Note:

1. The reagent and sample volumes may be altered proportionally to accommodate various instrument requirements.
2. "mEq/L" may be converted to "mg/dL" by multiplying the result by 1.2154.

Calculations:  
(A = Absorbance)

$$\frac{A(\text{patient})}{A(\text{standard})} \times \text{Concentration of standard (mEq/L)} = \text{Magnesium (mEq/L)}$$

Example:

$$\begin{aligned} A(\text{patient}) &= 0.140 \\ A(\text{standard}) &= 0.120 \\ \text{Concentration of standard} &= 2.0 \text{ mEq/L} \end{aligned}$$

$$\frac{0.140}{0.120} \times 2.0 = 2.3 \text{ mEq/L Magnesium}$$

#### Limitations:

1. Samples with values exceeding 5.0 mEq/L should be diluted 1:1 with saline and re-run. The final answer should be multiplied by two.
2. Hemolyzed samples should not be used for this assay.
3. Precautions should be taken to avoid magnesium contamination in specimens or reagent. The use of disposable plastic or acid-washed glass cuvettes and glassware is suggested.

### CALIBRATION

Use an aqueous Magnesium standard or an appropriate serum calibrator. Refer to appropriate instrument operator manual for recommend calibrator interval.

### QUALITY CONTROL

The integrity of the reaction should be monitored by use of a two level control with known Magnesium values

### EXPECTED VALUES<sup>10</sup>

1.3 – 2.1 mEq/L

The expected values were taken from literature. It is highly recommended that each laboratory establish its own reference range.

### PERFORMANCE

#### Linearity:

When run as recommended the assay is linear from 0.2 to 5.0 mEq/L

#### Method Comparison:

Studies performed between this procedure and a similar methodology yielded the following results:

Number of samples pairs:	42
Range of samples:	0.5 - 4.7 (mEq/L)
Correlation Coefficient:	0.995
Slope:	1.056
Intercept:	-0.2 (mEq/L)

#### Precision:

Within Run	Level 1	Level 2	Level 3
n=40			
Mean (mEq/L)	0.82	1.74	3.65
S.D. (mEq/L)	0.03	0.05	0.06
C.V. (%)	3.9	2.7	1.7

#### Total

n=40 (10 days / 2 runs per day / 2 replicates per run)			
Mean (mEq/L)	0.82	1.74	3.65
S.D. (mEq/L)	0.04	0.08	0.07
C.V. (%)	5.0	4.8	1.9

#### Sensitivity:

A calibration factor of approximately 10.7 was obtained, which is equivalent to a sensitivity of 0.093 D Abs per mEq/L.

### REFERENCES

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