



## Magnesium Fluid monoreagent

IN VITRO TEST FOR THE QUANTITATIVE DETERMINATION OF MAGNESIUM IN HUMAN SERUM, PLASMA AND URINE, BASED ON REACTION WITH XYLIDYLBLUE

REF	88 29 85	2x100ml
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### CALIBRATION

Magnesium standard 5ml 88 06 40

### QUALITY CONTROL

Control Serum N 6x5ml 88 41 48B

Control Serum P 6x5ml 88 46 85B

The control intervals and limits must be adapted to the individual laboratory and country-specific requirements. Values obtained should fall within established limits. Each laboratory should establish corrective measures to be taken if values fall outside the limits.

### SUMMARY

Magnesium along with potassium is a major intracellular cation.  $Mg^{2+}$  is a cofactor of many enzyme systems. Thus, all ATP-dependent enzymatic reactions require  $Mg^{2+}$  as a cofactor in the ATP-magnesium complex. Approximately 69% of magnesium ions are stored in bone. The rest are part of the intermediary metabolism about 70% being present in free form while the other 30% is bound to proteins (especially albumin), citrates, phosphate, and other complex formers. The  $Mg^{2+}$  serum level is kept constant within very narrow limits (0.65-1.05 mmol/l). Regulation takes place mainly via the kidneys, especially via the ascending loop of Henle.

This assay is used for diagnosing and monitoring hypomagnesemia (magnesium deficiency) and hypermagnesemia (magnesium excess). Numerous studies have shown a correlation between magnesium deficiency and changes in calcium-, potassium- and phosphate homeostasis which are associated with cardiac disorders such as ventricular arrhythmias that cannot be treated by conventional therapy, increased sensitivity to digoxin coronary artery spasms, and sudden death. Additional concurrent symptoms include neuromuscular and neuropsychiatric disorders. Hypermagnesemia is found in acute and chronic renal failure, magnesium excess, and magnesium release from the intracellular space. In addition to atomic absorption spectrometry (AAS), complexometric methods can also be used to determine magnesium. The method described here is based on the reaction of magnesium with xylydyl blue in alkaline solution containing EGTA to mask the calcium in the sample.

### TEST PRINCIPLE

Colorimetric endpoint method

The color intensity of the magnesium complex is proportional to the magnesium concentration and can be used for the photometric determination.

### NOTES

For in vitro diagnostic use.

Exercise the normal precautions required for handling all laboratory reagents.

### LIMITATIONS - INTERFERENCE

Criterion: Recovery within  $\pm 10\%$  of initial values

*Serum/plasma*

Icterus: No significant interference up to an index I of 10 corresponding to an approximate bilirubin concentration of 10 mg/dl.

Hemolysis interferes due to magnesium released from erythrocytes.

Lipemia (Intralipid): No significant interference up to an index L of 475 (approximate triglycerides concentration: 950 mg/dl). There is poor correlation between turbidity and triglycerides concentration.

### MEASURING/REPORTABLE RANGE

*Serum/plasma*

Measuring range: 0.04 mmol/l - 2.055 mmol/l (5 mg/dl)

In case of higher results, dilute sample 1:4 with saline solution and repeat test. Multiply result by 4

### NORMAL VALUES:

Serum	1.9-2.5 mg/dl	(0.78 – 1.0 mmol/l)
Cerebrospinal fluid	2.4-3.1 mg/dl	(0.98 – 1.3 mmol/l)
Urine	1-10 mg/dl	(0.41 – 4.1 mmol/l)
24 h urine	50-200 mg/dl	(20 - 80 mmol/l)

### Reference values according to Tietz:

Serum/plasma	1.3-2.1 mEq/l	(1.59-2.56 mg/dl)
2 – 4 days	1.2-1.8 mEq/l	(1.46-2.20 mg/dl)
5 months – 6 years	1.4-1.9 mEq/l	(1.71-2.29 mg/dl)
6 – 12 years	1.4-1.7 mEq/l	(1.71-2.07 mg/dl)
12 – 20 years	1.3-1.8 mEq/l	(1.59-2.20 mg/dl)
Urine	1.0-24.0 mEq/24 h	(12.2-292 mg/24 h)

Each laboratory should investigate the transferability of the expected values to its own patient population and if necessary determine its own reference range. For diagnostic purposes, the magnesium results should always be assessed in conjunction with the patients medical history, clinical examinations and other findings.

### ANALYTICAL SENSITIVITY (LOWER DETECTION LIMIT)

Detection limit: 0.04 mmol/l (0.09 mg/dl)

The lower detection limit represents the lowest measurable magnesium concentration that can be distinguished from zero.

### IMPRECISION

Reproducibility was determined using samples in an internal protocol. The following results were obtained.

Sample	Within run		
	Mean mg/gl	SD mg/dl	CV %
Sample 1	1.06	0.012	1.13
Sample 2	1.28	0.013	1.02
Sample 3	1.79	0.010	0.56

Sample	Between day		
	Mean mg/gl	SD mg/dl	CV %
Sample 1	1.03	0.023	2.28
Sample 2	1.27	0.023	1.28
Sample 3	1.81	0.062	3.43

### METHOD COMPARISON

A comparison of the AXIOM Magnesium Fluid monoreagent (y) with a commercial obtainable assay (x) gave with samples the following result:  $y = 0.903x + 0.121$ ;  $r = 0.986$

### REAGENT CONCENTRATION

#### RI:

Tris buffer pH 11.0	250 mmol/l
Xylydylblue	1 mmol/l
Detergent	15 g/l

### PREPARATION AND STABILITY

Reagent is ready for use. Avoid direct light. Keep bottles closed after use.

Unopened kit components: Up to the expiration date at +15°C to +25°C

**SPECIMEN**

Collect serum using standard sampling tubes.

Li-heparin plasma

Stability:	7 days	at +20°C to +25°C
	7 days	at + 4°C to + 8°C
	1 year	at -20°C

Haemolysed specimens are unacceptable.

Urine

Stability:	7 days	at +20°C to +25°C
	7 days	at + 4°C to + 8°C
	1 year	at -20°C

Collect urine sample in a metal-free container with no preservative. Acidify to approximately pH 3-4 prior to assay. Urine samples are manually diluted with distilled/ deionized water (e.g. 1 + 4). Multiply the result by the appropriate factor (e.g. 5).

Centrifuge samples containing precipitate before performing the assay.

**TESTING PROCEDURE**

*Materials provided*

- Working solutions as described above.

*Additional materials required*

- Calibrator and controls as indicated below

<b>Manual procedure:</b>			
Wavelength	Hg 546 nm (520 nm)		
Temperature	+25°C		
Cuvette	1cm light path		
Zero adjustment	Reagent blank. Each series needs one reagent blank only.		
	<i>blank</i>	<i>Standard / Calibrator</i>	<i>Sample</i>
<i>Reagent 1</i>	1000 µl	1000 µl	1000 µl
<i>Distilled water</i>	10 µl	---	---
<i>Standard</i>	---	10 µl	---
<i>Sample</i>	---	---	10 µl
Mix well and measure (A) after 5 minutes.			
Within 60 minutes read absorbance of sample and standard against reagent blank. Determine the absorbance change as $\Delta A_{\text{sample}} = (A_{\text{sample}} - A_{\text{blank}})$ $\Delta A_{\text{standard}} = (A_{\text{standard}} - A_{\text{blank}})$ and use this for the calculation.			
<b>Calculation:</b>			
$\frac{\Delta A_{\text{sample}}}{\Delta A_{\text{standard}}} \times \text{standard conc.} = \text{Magnesium conc. (mg/dl)}$			

**DISPOSAL**

Please note the legal regulations.

**LITERATURE**

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06/09 M/kd

**AXIOM Product range Clinical Chemistry**

Enzymes	Ions	Other Metabolites
Acid Phosphatase	Ammonium fluid	Bilirubin T/D
Alkaline Phosphatase	Copper fluid	Creatinine fluid
α-Amylase direct	Calcium fluid	Glucose GOD-PAP fluid
CK-NAC actived	Chloride fluid	Glucose Hexokinase fluid
CK-MB (NAC- actived)	Inorganic Phosphorus UV fluid	Urea Enzymatic fluid
γ-GT fluid	Iron fluid	Urea UV fluid
LDH fluid	TIBC	Uric Acid PAP fluid
Cholinesterase	Magnesium fluid	
GOT/ASAT fluid	Potassium fluid	<b>Controls</b>
GPT/ALAT fluid	Sodium fluid	
Lipase UV fluid		Control Serum N
Lactate PAP		Control Serum P
α-HBDH	<b>Proteins</b>	
	Albumin	
<b>Lipids</b>	CSF-Protein fluid	
Cholesterol fluid	Microprotein fluid	
HDL Cholesterol	Hemoglobin	
LDL Cholesterol	Protein Total fluid	
Triglycerides fluid		