Reagent kit for determination of magnesium ion concentration in serum and urine. A colorimetric xylidyl blue complex method.

Magnesium is an essential cofactor of several enzymes involved in the carbohydrate metabolism, synthesis of proteins and nucleic acids as well as muscular contraction. Further magnesium ions play an important role in neuromuscular transmission of stimuli and in the mechanism of calcium ion channel. Decreased serum magnesium levels are associated with chronic renal disease, haemodialysis, hepatic cirrhosis, gestational toxicosis, chronic alcoholism, aldosteronism as well as conditions with diarrhoea. Elevated serum magnesium concentrations are found in cases of dehydration, impaired renal function, hypothyroidism and Addison's disease.

Principle
Magnesium ion forms a colored complex with xylidyl blue under alkaline conditions. The intensity of the developed color is proportional to the magnesium ion concentration of the sample.

\[ Mg^{2+} + \text{xylidyl blue} \rightarrow \text{magnesium-xylidyl blue complex} \]

Reference values
Serum: 0.65-1.03 mmol/l (1.6-2.5 mg/dl)
It is recommended that each laboratory should assign its own normal range.

Reagents
1. Reagent (R1)
TRIS buffer pH=11.30 250 mmol/l
Xylidyl blue 1 mmol/l
Detergent
2. Magnesium standard
Ready for use. For details please check the insert.
Available only in Cat. No.: 45751S

Samples
Serum free of haemolysis. Urine (diluted in ratio of 1:10 with distilled water).
The sample should be adjusted to pH 3 - 4 with diluted hydrochloric acid.
For sampling and assay use plastic equipments only.

PROCEDURE

Working reagent
The reagent is ready for use.
If the absorbance of working reagent is higher than 1.2 at 492 nm the reagent cannot be used

Assay conditions
Wavelength: 500 (480-520) nm
Temperature: 37 °C
Cuvette: 1 cm pathway
Method: endpoint (increasing)

Pipette into cuvette

<table>
<thead>
<tr>
<th>pipette</th>
<th>blank</th>
<th>standard</th>
<th>sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>standard</td>
<td>10 µl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>sample</td>
<td>10 µl</td>
<td></td>
<td></td>
</tr>
<tr>
<td>working reagent</td>
<td>1 ml</td>
<td>1 ml</td>
<td>1 ml</td>
</tr>
</tbody>
</table>

Mix and incubate for 5 minutes then read the absorbance against blank.

Calculation

\[ \frac{A_{\text{sample}}}{A_{\text{standard}} \times C_{\text{standard}}} = C_{\text{sample}} \]

A = Absorbance, C = Concentration

Quality control
A quality control program is recommended for all clinical laboratories. The analysis of control material in both the normal and abnormal ranges with each assay is recommended for monitoring the performance of the procedure. Each laboratory should establish corrective measures to be taken if values fall outside the limits.

PERFORMANCES DATA

The following data were obtained using the Olympus 600 analyzer.

Linearity
The test is linear up to 2.5 mmol/l (6,08 mg/dl)

Sensitivity
It is recommended that each laboratory establishes its own range of sensitivity as this is limited by the sensitivity of the spectrophotometer used. Under manual conditions however, a change of 0.001 Abs is equivalent to 0.004 mmol/l (0.01mg/dl) magnesium concentration at 578 nm.

Precision

<table>
<thead>
<tr>
<th></th>
<th>Reproducibility</th>
<th>Average conc. (mmol/l)</th>
<th>SD</th>
<th>CV%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample I</td>
<td>Sample II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1.06</td>
<td>0.029</td>
<td>2.76</td>
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<td>1.80</td>
<td>0.038</td>
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Correlation
Comparative studies were done to compare our reagent with another commercial magnesium xylidyl blue assay.
The results from these studies are detailed below.
Correlation coefficient: \( y = 0.9890 \)
Linear regression: \( y = 0.972x + 0.057 \)
(x = other commercial reagent, y = own reagent)

Specificity
Bilirubin 855µmol/l (50mg/dl), lipid 1000mg/dl, glucose 55.5mmol/l (1000mg/dl) and ascorbic acid 2.84mmol/l (50mg/dl) don’t interfere with the assay up to the given levels.

Note
The dilution factor should be considered at the calculation of magnesium ion concentration of urine. Do not use reagents after the expiry date stated on each reagent container label. Do not use products, test solutions and reagents described above for any purpose other than described herein.

For in vitro diagnostic use only.

The following symbols are used on labels

<table>
<thead>
<tr>
<th>symbol</th>
<th>description</th>
</tr>
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<tbody>
<tr>
<td>IVD</td>
<td>For in vitro diagnostic use</td>
</tr>
<tr>
<td></td>
<td>Use by (last day of the month)</td>
</tr>
<tr>
<td></td>
<td>Temperature limitation</td>
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</table>

Bibliography