**Mg**²⁺ Determined with a Commercial Kit and the Technicon RA 1000 Analyzer

**To the Editor:**

Interest in rapid colorimetric methods for magnesium in biological fluids has increased (1–3). Several manufacturers now produce magnesium kits, and one of these (Optimise Ltd., London) has recently become commercially available in the United Kingdom. We have been using it routinely for nine months in our laboratory and we present here our observations on the precision, accuracy, specificity, and stability of the method.

The method is based on the dye Magon (4) [sodium 1-azo-2-hydroxy-3-(2,4-dimethyl carbonilido)-napthalene-1-(2-hydroxy) benzene-5-sulfonate], which, with magnesium ions in alkaline solution, forms a reddish complex having maximum absorbance at 508 nm. The kit is presented in the form of two reagents. Reagent 1 contains the color reagent and EGTA (ethylenebis(oxethylentri) tetrasacetic acid) to prevent calcium interference and surfactants. Reagent 2 is an alkaline buffer (carbonate; detailed composition not stated). For use in the Technicon RA 1000 analyzer, a working reagent—made by mixing equal volumes of reagents 1 and 2—is stable for several days at room temperature. The useful life of the kit itself, according to the manufacturer, is one year.

The RA 1000 settings that we have found satisfactory for this method are: extinction correction sample volume 4 μL, reagent volume 375 μL, wavelength 508 nm, and delay time 2 min. No standard is supplied with the kit, but we find Technicon’s “Set Point 2” calibrator to be suitable. Values for **Mg**²⁺ were assigned after repeated assay by atomic absorption spectrophotometry with an aqueous reference material (Spectrosoy; BDH Chemicals) as standard. The reaction is complete in less than 1 min. Absorbance is linearly related to concentration up to 2 mmol/L.

We assessed within- and between-batch precision of the method, using the low-, medium-, and high-concentration control sera routinely used in this laboratory (Table 1). The between-batch data were obtained during 12 weeks of normal routine use.

Twenty-one sera with consensus mean values (x) obtained from a national quality-control scheme were assayed with the kit (y). The relation between the results is given by the equation y = 1.01x - 0.01 (r = 0.9955). We also compared results with the kit (y) and our routine atomic absorption spectrophotometric method (z), assaying 104 patients’ samples by both methods. The resulting regression coefficient (r) was 0.984, and the line of best fit was given by the equation y = 1.03x - 0.02.

Phosphate is a potential source of interference in this method because magnesium and phosphate form an insoluble salt at alkaline pH (4). Forming the magnesium complex at neutral pH before developing the color in alkaline obviates this problem, and the manufacturers describe an alternative protocol for their kit that involves adding reagent 1 and reagent 2 separately to the patient’s sample. We saw no evidence that increased phosphate in serum caused a decrease in **Mg**²⁺ concentration under the conditions we were using, but a small but significant positive effect in results with the kit was apparently related to the phosphate concentrations. The difference (y) between the kit and atomic absorption results in a given sample was related to the phosphate concentration (x) as described by the equation y = 0.017x - 0.019 (r = 0.270, p < 0.01). The phosphate concentrations tested ranged from 0.45 to 2.77 mmol/L. We believe that this small effect, which indicates that the kit gives results on average 15 μmol/L higher than atomic absorption at a phosphate concentration of 2 mmol/L, is probably due to slight interference by other chromogens present in uremic sera. Whatever the cause, its clinical significance seems negligible.

In summary, this kit is reliable and easy to use. It has a major advantage over kits involving calmagite complexometry (3) in that the Magon dye is stable for several days in the mixed alkaline reagent. Results are precise and accurate, and the small volumes of sample required and the long-term stability of the method make it suitable for use in both clinical and research studies.

**References**


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Severe Depression of Serum Cholinesterase Activity Associated with Two Cases of Hepatic Encephalopathy

**To the Editor:**

We studied two cases of hepatic encephalopathy, the result of advanced liver cirrhosis. As expected, both patients showed hyperbilirubinemia and hypoglutaminemia (Table 1). As also indicated in Table 1, the encephalopathy was associated with a marked increase in glutamine in cerebrospinal fluid (CSF). Furthermore, glutamine concentrations in CSF (1) in both cases correlated positively with blood ammonia concentrations, although serum glutamine concentrations were nor-

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**Table 1. Precision of Results with the “Optimise” Magnesium Kit**

<table>
<thead>
<tr>
<th>Control</th>
<th>Within batch (n = 30 each)</th>
<th>Between batch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mg²⁺, mmol/L</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Low</td>
<td>0.61</td>
<td>0.006</td>
</tr>
<tr>
<td>Medium</td>
<td>0.86</td>
<td>0.018</td>
</tr>
<tr>
<td>High</td>
<td>1.49</td>
<td>0.024</td>
</tr>
</tbody>
</table>

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