More on Heparin Effect on Na Measurement

To the Editor:

In their paper (1) reporting their experience with two direct ion-selective electrode (ISE) sodium and potassium analyzers, Cowell and McGrady found misleadingly low sodium values in hyponatraemia with the Corning 902 analyzer as compared with results obtained by flame emission for heparinized plasma. We find a similar problem for serum (y = 1.143x − 18.7; r = 0.93; n = 88). As part of our evaluation of the same ISE analyzer we studied the effect of heparin on sodium measurement. Although heparin in high concentrations is known to interfere with sodium measurement (2), we found that at a heparin concentration of 300 int. units/L the value for sodium is depressed by 5 mmol/L (3). This concentration of heparin is achieved if small (e.g.) 1-mL blood samples are placed in inappropriately large (10 mL) commercial heparinized tubes. This could be a significant problem with pediatric specimens and also as the sample volume required for analysis by modern instrumentation decreases. To solve this problem we now routinely issue only the 2-mL pre-heparinized tubes in our hospital.

Although the possible effect of heparin was not mentioned by these authors it may have contributed to the lower sodium results obtained by the direct ISE methodologies.

References


A Reminder That Hyperlipidemia Interferes with Determination of Thyrotropin

To the Editor:

Serum thyrotropin (TSH) is commonly determined by radioimmunoassay (RIA) in thyroid-function studies in adults and children. Currently, it is the test of choice for diagnosis of hypothyroidism in patients suspected clinically of having thyroid disease. In neonates, TSH determination is always included in screening programs for hypothyroidism (1, 2). High TSH values suggest a diagnosis of congenital hypothyroidism (3).

In 1981, Bourdoux et al. (4) noted that neonates receiving parenteral nutrition had falsely high TSH values as a result of interference by the treatment. This interference was particularly significant when the serum sample was lactescent and when solid-phase separation or nonspecific precipitation of gamma-globulins was used in the TSH-RIA.

I describe here the case of a six-month-old child with normal psychomotor development, on whom thyroid-function tests were carried out to complement the clinical history. The serum sample (sample 1) had a lactescent appearance, attributed to the child's having been bottle-fed half an hour before.

TSH was determined with the reagents supplied in a kit (5) strictly according to the manufacturer's instructions, but no notice was taken of the information contained in the technical bulletin, in which it is recommended that lipemic or icteric samples be avoided (5). The results were as follows: thyroxin (T4)-CPB, 93 μg/L; triiodothyronine (T3) uptake, 28.6%; TSH, 33.0 int. units/L. Because there was no clinical evidence of hypothyroidism, serum was sampled again 4 h after the infant had last been fed (sample 2). The serum was absolutely clear. This new sample gave the following results: T4-CPB, 96 μg/L; T3 uptake, 30.5%; T3 RIA, 2.18 μg/L; TSH, 1.7 int. units/L. In view of the interference observed in sample 1, which had a frankly lipemic appearance, we carried out a lipid study on both samples.

Sample 1 contained cholesterol, 1.21 g/L, and triglycerides, 3.17 g/L; and the protein electrophoresis showed chylomicrons. In contrast, sample 2 was absolutely normal: cholesterol, 1.14 g/L; triglycerides, 0.97 g/L; and a normal lipoprotein electrophoretogram.

Attempting to understand the cause of the interference, we added 100 μL of anti-TSH antiserum from the kit to 200 μL of each of the serum samples and incubated the tubes at room temperature for 24 h, then added 100 μL of 125I-labeled TSH from the same kit to each sample and incubated at 37 °C for 3 h. Protein electrophoresis was carried out on cellulose acetate, in Tris-borabital buffer. The band corresponding to each fraction was cut into 2-mm strips and the radioactivity of each sample was counted in a gamma counter for 10 min. The radioactivity in the gamma-globulin of the lipemic serum just exceeded that of the same fraction of sample 2, suggesting that hyperlipidemia does not affect the antigen-antibody reaction between the TSH-specific antiserum and the 125I-labeled hormone. To study the precipitation of the antigen-antibody complex, we prepared tubes containing 100 μL of 125I-labeled TSH and 100 μL of anti-TSH antiserum and incubated these for 24 h at room temperature. We then added 200 μL from the samples to the corresponding tubes, added the precipitant immediately afterwards, and centrifuged. The supernatant fluid was aspirated and the radioactivity in the tubes was counted in a gamma counter. The B/B0 × 100 index, calculated for each sample, was as follows:

<table>
<thead>
<tr>
<th>Samples</th>
<th>Count/min (B/B0) × 100</th>
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</thead>
<tbody>
<tr>
<td>TSH zero std.</td>
<td>5322 (100.0)</td>
</tr>
<tr>
<td>Sample 1</td>
<td>1964 (36.9)</td>
</tr>
<tr>
<td>Sample 2</td>
<td>6450 (102.9)</td>
</tr>
<tr>
<td>Control</td>
<td>5300 (99.6)</td>
</tr>
</tbody>
</table>

(normal)