autoantibodies in the patient's serum was established by a normal result for binding of radioactive T₃ in sera of both the patient and a control subject. A measurement of protein-bound iodine several months later was approximately twice normal at 194 mmol/L (reference range 65–103 mmol/L), which did not approach the unusually high results for T₄. Anti-thyroglobulin and anti-thyroid microsomal antibodies were detected at titers of 1:5600 and 1:1600, respectively, establishing the presence of immunothyroid disease in the patient.

This case represents one of the highest apparent values of T₄ reported in a clinically nonthyrotoxic patient. This high value is all the more unusual because of its temporal association with a distinct increase in TSH. As the clinical laboratory continues to rely on assays involving antibodies as reagents, one may expect more cases of interference from endogenous antibodies such as the false thyroxinemia observed in this patient.

References

Sandra Lowry
Phillip Eaton
Jim Standefer
Chris Nelson

Depts. of Pathol. and Med.
Univ. of New Mexico School of Med.
Albuquerque, NM 87131

Urinalysis with an Abbott EPX Spectrum Analyzer

To the Editor:

Currently, no routine methods are available for urinalysis with an EPX Spectrum analyzer (Abbott Labs., North Chicago, IL). Here, we describe minor modifications to procedures for quantifying sodium, potassium, and creatinine in serum that permit these same analyses to be performed with urine specimens.

The protocols of analyses for urinary sodium and potassium were essentially those used for serum specimens, except that specimens for potassium analysis were manually prediluted 10-fold with isotonic saline (9 g of NaCl per liter). This additional step was necessary because some specimens gave falsely low potassium values upon direct analysis by ion-selective electrode. Specimens for estimation of urine creatinine were effectively made more dilute than in the corresponding serum assay by using a smaller specimen volume (2 μL) and a larger reagent volume (472 μL). The calibration for creatinine was made by dissolving creatinine zinc chloride (BDH Ltd., Poole, Dorset, U.K.) in HCl (0.1 mol/L) to give a creatinine concentration of 10 mmol/L.

The statistical data in Table 1 indicate acceptable performance for all analytes. The results of sodium analysis required correction to avoid unacceptably high bias at concentrations <40 mmol/L (for concentrations in the range of 0–80 mmol/L, observed Na = 0.955 × expected Na + 4.9 mmol/L), possibly because the lower calibration point was 60 mmol/L. The correction factors indicated in Table 1 may be subject to variation but appeared valid for the four electrodes tested.

We conclude that by simple modification of existing protocols for analyses in serum, the Abbott EPX Spectrum can be used to test urine specimens for sodium, potassium, and creatinine with acceptable performance. Such analyses have been done reliably in our laboratory for more than 12 months without detrimental to the ion-selective electrode assembly.

David J. Bunkall
Roger N. Johnson

Dept. of Clin. Biochem.
Green Lane Hosp.
Auckland, New Zealand

Abbott TDx “Selective” Assay Overestimates Cyclosporine in Whole Blood

To the Editor:

Routine blood cyclosporine (CaA) is assayed by high-performance liquid chromatography (HPLC), considered the “reference method,” or by radioimmunoassay (RIA). The most popular

---

Table 1. Performance of Urinalysis Procedures

<table>
<thead>
<tr>
<th></th>
<th>Sodium</th>
<th>Potassium</th>
<th>Creatinine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.5(19)</td>
<td>0.3(37)</td>
<td>1.4(7)</td>
</tr>
<tr>
<td>Intraday</td>
<td>0.1(141)</td>
<td>0.6(154)</td>
<td>1.2(17)</td>
</tr>
<tr>
<td>Interday</td>
<td>1.1(75)</td>
<td>1.7(27)</td>
<td>2.4(7)</td>
</tr>
<tr>
<td></td>
<td>1.0(172)</td>
<td>2.1(43)</td>
<td>2.3(10)</td>
</tr>
</tbody>
</table>

Imprecision: CV, %

<table>
<thead>
<tr>
<th></th>
<th>Sodium</th>
<th>Potassium</th>
<th>Creatinine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15-190</td>
<td>9-125</td>
<td>1.8–20.0</td>
</tr>
<tr>
<td>Range, mmol/L</td>
<td>0.999</td>
<td>1.000</td>
<td>1.000</td>
</tr>
<tr>
<td>Slope</td>
<td>0.978</td>
<td>1.008</td>
<td>1.036</td>
</tr>
<tr>
<td>Intercept, mmol/L</td>
<td>1.5</td>
<td>-0.8</td>
<td>0.0</td>
</tr>
<tr>
<td>Range, mmol/L</td>
<td>11-146</td>
<td>12-147</td>
<td>2.0–18.6</td>
</tr>
<tr>
<td>Slope</td>
<td>1.000</td>
<td>0.999</td>
<td>0.999</td>
</tr>
<tr>
<td>Intercept, mmol/L</td>
<td>0.973</td>
<td>1.007</td>
<td>0.989</td>
</tr>
<tr>
<td>Range, mmol/L</td>
<td>1.0</td>
<td>0.9</td>
<td>0.2</td>
</tr>
<tr>
<td>Analytical recovery, %</td>
<td>99.8(53)</td>
<td>97.5(26)</td>
<td>99.4(3)</td>
</tr>
<tr>
<td></td>
<td>103.1(106)</td>
<td>98.7(48)</td>
<td>99.7(6)</td>
</tr>
<tr>
<td>Linear range, mmol/L</td>
<td>10–200</td>
<td>10–200</td>
<td>0–200</td>
</tr>
</tbody>
</table>

*All sodium values were corrected automatically with a slope factor of 1.04 and intercept of –5 mmol/L.

**Intraday imprecision was measured with patients' specimens and interday imprecision with quality-control urine (Lyphochek; Bio-Rad, Hercules, CA). n = 20 each.

*Mean concentration, mmol/L, given in parentheses.

**Compared with Beckman Ausa 8 established methodologies for analytes in urine. n = 20 each.

*Urine specimens with defined target values from the Royal College of Pathologists of Australasia Quality Assurance Programme. n = 10 each.

*Concentration of added analyte, mmol/L, given in parentheses. n = 25 each.

*May be extended to 32 mmol/L by use of automation facility.
commercially available kits for RIA are the Sandimmune kit (Sandoz, Basel, Switzerland), and the Cyclo-tracSp kit (Incatar Corp., Stillwater, MN). Both of these kits use the same monoclonal antibody and give similar results. This monoclonal antibody is produced by Sandoz to be selective for the parent compound. However, because of cross-reactivity with some CsA metabolites, the Sandimmune kit yielded results ~12% higher than by HPLC in 44 renal patients (1).

Recently, an assay of CaA has been developed for the Abbott TDx (Abbott Diagnostics, N. Chicago, IL 60064) in which another Sandoz antibody specific for the parent compound is used (2). This new assay was evaluated by Yatscoff et al. (3), who reported good correlation between results by TDx, HPLC, and RIA (Sandimmune kit).

Their study of CaA in whole blood from 44 renal-transplant recipients indicated that the TDx values averaged 24% higher than the HPLC values.

We evaluated the new TDx assay, using controls and also trough blood samples from the following transplant recipients: heart (n = 77), liver (n = 52), renal (n = 22), and "others" (n = 15), which included bone marrow transplant recipients and patients with autoimmune disease. We assayed all of the patients' samples (n = 166) by HPLC (4) and a portion (n = 55) by RIA (Sandimmune kit); both of these assays are used routinely for CaA monitoring in our laboratories and both perform well in both internal quality-control schemes and in the Cyclosporine Quality Assurance Scheme, London, U.K. Whole-blood CaA calibrators provided with the TDx kit were assayed by HPLC and RIA, and yielded values identical to those assigned to them by the manufacturers.

Whole-blood CaA values by the TDx in 166 patients were, on average, 48% higher than those by HPLC (Figure 1A). Results were higher for all transplant types, and the extent of the overestimation varied greatly. The percentage of overestimations (mean, range) for the main groups were as follows: heart (38%, -15% to 96%), liver (54%, -7% to 135%), and renal (55%, -4% to 89%).

The correlation coefficients and regression equations for the main types of organ transplants were as follows:

Heart, TDx = 1.36 HPLC + 26 (r = 0.95, n = 77); TDx = 1.14 Sandimmune + 22 (r = 0.97, n = 15).

Liver, TDx = 1.25 HPLC + 57 (r = 0.90, n = 52); TDx = 0.88 Sandimmune + 115 (r = 0.85, n = 12).

Renal (same 17 patients analyzed by all three assays), TDx = 1.52 HPLC - 8 (r = 0.93); TDx = 1.09 Sandimmune + 63 (r = 0.89).

The overall regression equations for all samples assayed were as follows: TDx = 1.22 HPLC + 46 (r = 0.94, n = 166); TDx = 1.06 Sandimmune + 66 (r = 0.96, n = 55).

For the renal patients, our regression equation is markedly different from that of Yatscoff et al. (3), TDx = 1.14 HPLC + 6 (r = 0.967, n = 44; Yatscoff et al.); TDx = 1.57 HPLC - 10 (r = 0.95, n = 22; this report).

Results for the Abbott TDx kit compared with those for the RIA were as follows: TDx = 1.03 Sandimmune + 5 (r = 0.98, n = 44; Yatscoff et al.); TDx = 1.06 Sandimmune + 66 (r = 0.96, n = 55; this report, Figure 1B). In our study, the 55 samples assayed by the TDx gave values 19% higher than when assayed by RIA (Sandimmune). This compares with a 6% assay difference reported by Yatscoff et al. (3).

We found results (n = 39) 12% higher by Sandimmune RIA than by HPLC, in agreement with the findings of Johnston et al. (1). We conclude that, in our hands, the monoclonal antibody used in this TDx assay is not as specific for CaA as claimed by Yatscoff et al. (3), and that the extent of overestimation varies broadly in all transplant types. Although the assay is rapid, precise, and has probable clinical utility, it is not as accurate as either the HPLC reference method or the Sandimmune specific monoclonal assay.

Some caution should be exercised in the interpretation of results, and the assay requires further investigation.

References

Frank Kyne1
Sean Maguire1
Sean O'Brien2
Peadar McGing1
Shaun McCann2
Edwin Wright1

1 Biochem. Lab.
Mater Misericordiae Hosp.
Dublin 7, Ireland
2 Dept. of Haematol.
St. James's Hosp.
Dublin 8, Ireland

Effect of Storage Time on Peptic Activity in Gastric Biopsies

To the Editor:

Pepsin appears to play a crucial role in the development of acute and chronic ulceration in the upper gastrointestinal tract (1, 2). However, which method to use to evaluate pepsin secretion is still debated (3). Several factors may compromise the accuracy of pepsin measurement in gastric juice; in particular, the storage time appears crucial to a reliable determination (4, 5). A different approach involves the direct measurement of pepsin-pepsinogen concentrations in gastric mucosa. As yet, no data are available on the influence of storage time on pepsin activity in mucosal biopsies. Here we report the results obtained for pepsin activity measured in mucosal biopsies stored for different times.

Twelve biopsy specimens were obtained from six duodenal ulcer patients (five men, one woman, mean age 48 years, range 28-60 years) during upper gastrointestinal endoscopy: one specimen each from the fundus, another from the corpus of each subject's stomach. The specimens were

Fig. 1. Cyclosporine concentrations in whole blood determined by the Abbott TDx (monoclonal antibody) vs (A) HPLC and (B) the Sandimmune selective RIA

1658 CLINICAL CHEMISTRY, Vol. 37, No. 9, 1991