To evaluate precision we used one sample from a smoker and one sample indicating passive inhalation. The calculated within-assay CV of 10 replicates (80-μL volumes) was 4.5% at 5.2 μg/L and 1.4% at 220 μg/L.

The reagents and assay standards proved stable over a 3-month period. However, as with commercially prepared reagents, recalibration was desirable every week or so.

Although the antisera was previously found to have negligible cross-reactivity with nicotine and the metabolites 1-N-oxide, isonicotinic acid, pyridylacetic acid, nicotinic acid, and nicotinamide (4), other metabolites, such as the glucuronic acid conjugates, were unavailable for testing. As with any hapten immunoassay (whether polyclonal or monoclonal antisera are used), interactions with other small molecules may only become apparent after extensive practical application.

Large-scale epidemiological studies on smoking require a simple, automated process for the assay of cotinine, and we believe that the Abbott TDx used with saliva samples would fulfill this role. The greater sensitivity attainable with saliva gives a much clearer differentiation between smokers and nonsmokers than the urine assay reported previously (5) and may be useful in the study of passive inhalation.

References

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Bromoresol Purple Dye-Binding and Immunoturbidimetry for Albumin Measurement in Plasma or Serum of Patients with Renal Failure

To the Editor:
Serum albumin concentration at the time of hospitalization for acute illness is an important variable and may be used to predict death, length of stay, and readmission (1). Furthermore, the plasma albumin concentration in hemodialysis patients may be considered a prognostic factor of life expectancy (2). In patients with renal failure being treated with continuous ambulatory peritoneal dialysis (CAPD), the patient’s nutritional status, as reflected by the serum albumin concentration, is predictive of survival on CAPD (3). Therefore, it is important to quantify the albumin concentration in plasma (or serum) by a method not subject to interference by endogenous serum or plasma compounds.

Current methods to quantify albumin in serum or plasma include dye-binding by bromoresol green (BCG) or bromoresol purple (BCP) and immunochromatographic methods such as immunoturbidimetry. BCG methods suffer from nonspecificity, especially in samples with a low albumin/globulin ratio (4–6); these results may be improved by using a BCG method with a very short reaction time (7). BCP methods are less affected by globulins and other proteins; however, they underestimate the albumin concentration in serum of patients with chronic renal failure (CRF) being treated by hemodialysis or in serum from patients who received a kidney transplant (8, 9). In serum samples from these hemodialysis patients, increased concentrations of a nondialyzable substance, 3-carboxy-4-methyl-5-propyl-2-furanpropionic acid (CMPF), a furan nonesterified fatty acid, inhibit the binding of BCP to human albumin, resulting in an underestimation of measured albumin concentrations (10). In a group of 22 hemodialysis patients this serum CMPF concentration correlated with the percent difference of the serum albumin concentration between the BCP and immunoturbidimetry method (10). In addition, in a patient’s serum containing albumin carrying covalently bound bilirubin (11), the BCP method also underestimates the albumin concentration. In these groups of patients, immunochromatographical determinations of albumin are to be preferred (4).

We were interested in knowing whether the albumin concentration in samples from patients showing an impaired renal function but not being treated by hemodialysis (e.g., patients being treated with CAPD or showing increased serum creatinine concentrations) could be quantified correctly by the BCP dye-binding method.

We performed albumin determinations with the BCP method from Boehringer Mannheim (Mannheim, Germany; cat. no. 749079) on the Hitachi 705 Analyzer (Boehringer) and by immunoturbidimetry with reagents from Daco (Glostrup, Denmark) on the Multistat III (Instrumentation Laboratory, Ascoli, Italy). All determinations were performed according to the manufacturers’ instructions. To calibrate the albumin determination by immunoturbidimetry, we used a human serum protein calibrator (Dako; no. X 908).

First we assessed the albumin concentration in serum from 10 healthy laboratory workers, then used these 10 albumin values to recalibrate the standard used with the commercially available BCP kit. In using this calibration procedure we prevented differences in measured albumin concentration results in patients’ samples caused by possibly incorrect values for the different calibrators used with these two methods.

We measured the albumin concentration in plasma (anticoagulated with heparin) in 35 patients with renal failure (measured serum creatinine range, 143–916 μmol/L) by both immunoturbidimetry and the BCP method to investigate whether the use of heparin as an anticoagulant would introduce a bias between these two methods. We then determined the albumin concentration in plasma (anticoagulated with heparin) from 22 patients with CRF being treated with hemodialysis, in serum from 15 patients with CRF being treated with CAPD, and in serum from 22 patients
with increased serum creatinine concentrations.

Results of the albumin determinations by the two methods were compared by the one-tailed paired Student’s t-test for the hemodialysis group. We used the two-tailed paired t-test (12, 13) for the other two groups of patients studied here and for the group of 35 patients with increased serum creatinine concentrations. For this last group we obtained mean albumin concentrations of 30.3 (immunoturbidimetry) and 30.6 g/L (BCP); the mean difference between albumin concentration as measured by both methods was –0.3 g/L; and the calculated SD of differences was 1.63 g/L (P >0.2). We conclude that the use of heparin plasma does not introduce a bias between the two methods.

As Table 1 shows, the BCP method does not quantify the albumin concentration in plasma of hemodialysis patients correctly, in agreement with earlier results (9–10). We determined albumin concentrations in the plasma of all 22 hemodialysis patients by the two methods on three different occasions (~4 months apart) and obtained similar results. We quantified the albumin concentrations in serum of two of these patients after their method of treatment changed from hemodialysis to CAPD. The calculated difference in albumin concentration as measured by immunoturbidimetry and BCP (patient 1, 6.1 g/L; patient 2, 4.8 g/L) during the hemodialysis period decreased gradually and was no longer present ~6 months after this change in treatment. These results suggest that the interfering substance(s) might be associated with the hemodialysis and not with renal insufficiency. During these 6 months, albumin concentrations in serum of these two patients were quantified correctly only by immunoturbidimetry. Likewise, it seems advisable to use immunoturbidimetry to quantify a patient’s albumin concentration in serum if the treatment is changed from CAPD to hemodialysis.

Results (Table 1) show that the BCP method does quantify correctly the albumin concentration in serum of patients with CRF being treated with CAPD, or in serum of patients showing increased creatinine concentrations. These results also suggest that the interfering substance might be associated with the hemodialysis and not with the renal insufficiency.

We conclude that the BCP method does quantify accurately the albumin concentration in serum of patients with CRF being treated with CAPD or in serum of patients showing increased serum creatinine concentrations but not in plasma of patients with CRF being treated by hemodialysis.

References

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Identification of UrinAid-Adulterated Urine Specimens by Fluorometric Analysis

To the Editor:

Among commercially available adulterants used to create a negative result in a urine that is otherwise positive for one or more drugs, UrinAid (Byrd Labs., CA) presents a special challenge to laboratories engaged in urine drug testing (Department of Health and Human Services, National Certification Program Inspector Workshop. October 15, 1993. Phoenix, AZ). The major component of UrinAid is reported (1) to be glutaraldehyde (GA). Depending on the concentration of GA in the urine (which varies greatly depending on the concentration of GA in the UrinAid, the volume of UrinAid used, and the volume of urine provided by the donor), urine adulterated with UrinAid can pass as drug-negative upon analysis by enzyme immunosay (EIA; e.g., by Syva (Palo Alto, CA) Emit II or Diagnostic Reagents (Mountain View, CA) EIA) without indication of the adulteration (Table 1). Here we submit data in terms of GA concentration and do not attempt to relate these concentrations to actual UrinAid use.

Given the likelihood that future regulations may be applied to drug testing laboratories with regard to adulteration, we report here a simple,