

Between-day imprecision was <3.6% for various TBIL concentrations, quite satisfactory for conventional techniques.

Results for 121 sera from hospitalized patients, with a range of 2.0 to 412 mg/L, were compared with results by the TBIL method used in the Ektachem 400 and 700 analyzers.

The linear regression equation relating the two methods was: Vision = 1.06 Ektachem + 2.2 mg/L;  $r = 0.991$ . A nonpaired  $t$  analysis revealed no significant difference between results by the two methods.

The Vision can use whole blood and plasma, as well as serum, as samples, so we compared 40 TBIL results for paired whole-blood and plasma specimens from 40 hospitalized patients with those by the Ektachem reference method for the same plasma specimens. These 40 patients had various hematological abnormalities, most notably decreased hemoglobin and (or) hematocrits, and decreased erythrocyte counts. The following linear regression equations summarize these analyses:

Vision whole blood = 0.97 Vision plasma + 0.4 mg/L;  $r = 0.999$

Vision whole blood = 0.88 Ektachem plasma - 0.4 mg/L;  $r = 0.997$

Vision plasma = 0.92 Ektachem plasma + 1.9 mg/L;  $r = 0.999$

Overall, results with the Vision TBIL method show a 6 to 12% positive bias as compared with the Ektachem. Our previous studies (1) indicated that the Ektachem method demonstrated about a 4% negative bias when compared to the Jendrassik-Graf method. We consider the net 2-8% difference in TBIL results between the two methods to be clinically acceptable. The Vision TBIL method was free of interference from triglycerides ( $\leq 7$  g/L), but hemoglobin concentrations of 1.5 g/L cause a 10% decrease in apparent TBIL. We calibrated only once during a four-week period, and the system maintained stable calibration.

#### Reference

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#### Falsely High Values for Chloride in Serum Containing Myeloma Proteins, Measured in the Paramax, Joyce G.

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We observed falsely increased values for  $\text{Cl}^-$  in asymptomatic multiple-myeloma patients with an abnormally high protein concentration in their serum. When direct potentiometry was used, the values were lower. We obtained additional specimens of serum from patients with multiple myeloma and demonstrated that the hyperchloremia was spurious and was caused by high concentrations of a para-protein interfering (an artifactual increase in light absorption as a result of protein precipitation) with the chromogen-

**Table 1. Chloride Measurements in Myeloma Patients**

Patients with multiple myeloma	$\text{Cl}^-$ , mmol/L	Total protein, g/L
Patient 1	111 (N) <sup>a</sup>	98 (P)
	161 (P)	
Patient 2	114 (N)	130 (P)
	161 (P)	
Patient 3	115 (N)	136 (P)
	134 (P)	
Patient 4	99 (N)	79 (P)
	96 (P)	
Patient 5	110 (N)	76 (P)
	111 (P)	

<sup>a</sup>(N) = Nova, (P) = Paramax.

ic assay in the "Paramax" analyzer (Baxter Healthcare Corp., Paramax Systems Div., Irvine, CA 92718-2017). Because this type of assay, adapted for automated systems, is now widely used in clinical laboratories, we call attention to this limitation to avoid confusion in clinical evaluations of patients with multiple myeloma (1-5).

We analyzed sera from five patients, diagnosed with multiple myeloma, for chloride and total protein, using two instruments: the Paramax for chloride and total protein, and the Nova 4+4 (Nova Biomedical, Waltham, MA 02254-9141) for chloride. A paired  $t$ -test was performed on 28 chloride results to justify the comparison between the two chloride methods.

Results of the paired  $t$ -test revealed a  $t$  value of 1.77 (13 df) and a  $P$  value of 0.101, which indicates that results by the two methods were similar. The coefficient of correlation between the two methods was 0.814.

Multiple-myeloma patients with a total protein  $\geq 98$  g/L demonstrated increased apparent  $\text{Cl}^-$  (pseudohyperchloremia) when their serum was evaluated in the Paramax. When the same patients' samples were analyzed in the Nova 4+4 (direct potentiometry),  $\text{Cl}^-$  values fell within the normal range.

Serum samples were analyzed in multiple-myeloma patients with total proteins <80 g/L, and no clinically significant difference between results on different instrumentation was noted (Table 1).

We observed falsely high values for serum  $\text{Cl}^-$  in multiple-myeloma patients because of a flocculent protein precipitate interfering with chromogenic methodology in the Paramax, and we recommend that all patients with multiple myeloma be screened for total protein. If the total protein exceeds 80 g/L then direct potentiometry should be used for measurement of  $\text{Cl}^-$ .

#### References

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