routinely muscleation from LDL1 we
talation compared
calculated (LDL).

LDL = total chol − HDL − (trig/5.0)

The formula is based on the assumption that the ratio of the constituents of very-low-density lipoprotein (triglyceride to cholesterol) is constant, about 5/1, in the absence of chylomicron.

At our hospital, we have routinely determined LDL by electrophoresis, but with both costs and interest in lipids increasing, we needed a simpler method. This prompted us to use the Friedewald formula and ascertain the correlation between LDL as determined by electrophoresis and by calculation. To evaluate the formula, we examined this correlation for sera from 388 patients—tabulating age, sex, LDL experimental (LDL\text{exp}) data, calculated LDL (LDL\text{cal}) concentrations, HDL, very-low-density lipoprotein, total cholesterol, and triglyceride. We compared LDL\text{exp} and LDL\text{cal} by using the ANOVA multiple regression statistical package (4) for various concentrations of triglyceride, LDL\text{cal} age, and sex. Finally, on the basis of results for the total population, we compared LDL\text{exp} with LDL\text{cal} determined from the Friedewald formula, using values from 4.0 to 6.0, in 0.2 increments, substituted for the standard 5.0 value.

As seen in Table 1, as the concentration of triglyceride increased, the correlation decreased slightly up to 9.0 g/L. LDL\text{exp} was unchanged at or below 1.75 and 2.0 g/L (Table 1). Likewise, we saw no significant difference in correlation with respect to age or sex. The average difference between LDL\text{cal} and LDL\text{exp} was 0.0987 g/L. When 0.0987 g/L was subtracted from LDL\text{cal} concentrations, the coefficient for the correlation between LDL\text{exp} and LDL\text{cal} was 0.99.

The correlation between LDL\text{cal} and LDL\text{exp} remained relatively insensitive to changes in the constant 5.0 over the range 4.0 to 6.0. However, at 4.6 the slope was closest to one. Thus we suggest two modifications to increase the accuracy of the Friedewald formula:

\[
\text{LDL} = \text{total chol} - \text{HDL} - (\text{trig/5.0}) + 0.0987 \text{g/L}
\]

A recent report by Demacker et al. (5) compared results calculated by the Friedewald formula with those by three precipitation methods for determining LDL. The comparison was favorable, suggesting that LDL can be calculated if cholesterol, triglyceride, and HDL concentrations are determined. We support this and suggest that the accuracy of the Friedewald formula will be enhanced by incorporating either of the above modifications.

References

Raymond S. Niedbala
Keith J. Schray

Table 1. Statistical Results When Triglyceride Concentration, Age, Sex, and LDL\text{exp} Values Were Varied

<table>
<thead>
<tr>
<th>Avg conc, g/L</th>
<th>LDL\text{exp}</th>
<th>LDL\text{cal}</th>
<th>r</th>
<th>Std error</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triglyceride concn, g/L</td>
<td>1.3397</td>
<td>1.4469</td>
<td>0.93</td>
<td>13.88</td>
<td>254</td>
</tr>
<tr>
<td>&lt;3.0</td>
<td>1.3452</td>
<td>1.4612</td>
<td>0.92</td>
<td>14.63</td>
<td>293</td>
</tr>
<tr>
<td>&lt;4.0</td>
<td>1.3412</td>
<td>1.4444</td>
<td>0.91</td>
<td>15.73</td>
<td>301</td>
</tr>
<tr>
<td>&lt;5.0</td>
<td>1.3396</td>
<td>1.4409</td>
<td>0.91</td>
<td>15.90</td>
<td>303</td>
</tr>
<tr>
<td>&lt;12.0</td>
<td>1.2833</td>
<td>1.3684</td>
<td>0.87</td>
<td>15.55</td>
<td>287</td>
</tr>
<tr>
<td>LDL\text{exp}&lt;2.0 g/L</td>
<td>1.2178</td>
<td>1.3055</td>
<td>0.86</td>
<td>13.91</td>
<td>257</td>
</tr>
<tr>
<td>LDL\text{exp}&lt;1.75 g/L</td>
<td>1.3494</td>
<td>1.4441</td>
<td>0.90</td>
<td>16.28</td>
<td>198</td>
</tr>
<tr>
<td>Male</td>
<td>1.3186</td>
<td>1.4249</td>
<td>0.91</td>
<td>15.98</td>
<td>107</td>
</tr>
<tr>
<td>Female</td>
<td>1.3206</td>
<td>1.4179</td>
<td>0.91</td>
<td>15.81</td>
<td>241</td>
</tr>
</tbody>
</table>

Dept. of Clin. Biochem.
The Hospitals for Sick Children
Great Ormond St.
London WC1, U.K.

Light Chain Disease and Massive Proteinuria: Comment

To the Editor:

Lessard et al. recently reported the case of a patient with light chain myeloma (1). It is interesting to note this relatively rare but well-documented case of myeloma. They were lucky to be able to demonstrate a light-chain band in the serum electropherogram for this patient. The usual picture is that, owing to rapid clearance of the light chains by glomeruli, an M component is not seen in the serum electropherogram but is seen in electrophoresis of an adequately concentrated urine sample. This case illustrates the importance of electrophoresing samples of serum and urine concurrently; otherwise 15 to 20% of the myeloma cases that are of light-chain origin (2) would be misdiagnosed if only serum is electrophoresed. Very rarely an M component is not detected in either serum or urine. These are the so-called nonparaprotein myeloma, in which the tumour tissue has de-differentiated to such an extent that it fails to produce any recognizable heavy or light chains at all. These cases are highly malignant, because biochemical de-differentiation parallels malignant de-differentiation (3). Diagnosis of such myeloma depends on bone-marrow biopsy and radiological investigations. Severe immunodeficiency is observed in these patients, and myeloma has to be still suspected in clinically suggestive patients who do not show an M component in either serum or urine.

References

L. V. K. De Silva
F. Taylor

Dept. of Clin. Biochem.
The Hospitals for Sick Children
Great Ormond St.
London WC1, U.K.

CLINICAL CHEMISTRY, Vol. 31, No. 10, 1985 1763