Simple Quantitation of Serum Lipid Fractions

To the Editor:

There is little awareness of simple methods to quantitate the lipid fractions other than the high-density-lipoprotein (HDL) fraction. The methods I use have been published (1–6). They involve adsorption, with use of magnesium compounds. Two steps are used: a) Adsorb serum by gentle agitation for 90 min with light magnesium carbonate in the ratio of 0.14 g/mL of serum. Centrifuge, and determine the cholesterol (or other lipid or protein) in the supernate. b) Adsorb in a similar fashion, but use a mixture of light magnesium carbonate and magnesium trisilicate, both 0.14 g/mL.

Three fractions can be calculated:

- Pre-beta cholesterol = cholesterol B. This is a direct reading.
- Beta cholesterol = total cholesterol – cholesterol A = (⅔ HDL cholesterol). This appears to represent the main slow-moving part of the beta band seen on cellulose-acetate lipoprotein electrophoresis.
- "Mid-beta cholesterol" = total cholesterol – HDL cholesterol – beta cholesterol – pre-beta cholesterol. This appears to represent the fast-moving part of the beta band.
- "Total beta cholesterol" = beta cholesterol + "mid-beta cholesterol."

The “mid-beta lipoprotein” can be expressed as a percentage of beta apolipoprotein by quantitating the apoprotein in the supernates after adsorption, i.e., \[\left(\frac{A - B}{\text{total}}\right) \times 100\].

The HDL:total beta-cholesterol ratio can be expressed routinely. More recent observations are that the Fredrickson type 3 protein and lipoprotein-X appear to behave in a similar fashion to the pre-beta component in these methods; thus a distinct beta band after adsorption indicates the intermediate lipoprotein of the Fredrickson type 3. The "mid-beta" lipoprotein does not appear to behave in an identical fashion, so its identity is uncertain. Does it represent the "normal" intermediate lipoprotein?

Because these techniques are so easy and there is decreased reliance upon patients fasting, I quantitate all these fractions routinely when both the total cholesterol and total triglycerides are abnormally high.

References

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More on the Performance of the IL282 CO-Oximeter in the Presence of Perfluorochemical Emulsion, Fluosol-DA

To the Editor:

Sehgal et al. presented (1) results of data regarding the function of the IL282 CO-Oximeter in the presence of a perfluorochemical emulsion (PFC). They found an excellent correlation between erythrocyte oxygen content as measured with the IL282 CO-Oximeter and as measured with an O2-specific fuel cell method (Lex-O2-Con; Lexington Instruments, Waltham, MA 02154). From these results, they concluded that the IL282 CO-Oximeter functioned reliably for the measurement of erythrocyte O2 content in the presence of PFC emulsions. Total blood oxygen content is obtained by adding the erythrocyte O2 content and the dissolved oxygen (plasma and PFC contributions).

These authors appropriately investigated this question because there is a possibility that the small (mean diameter, 0.1 μm) PFC droplets could interfere with optical measurements in the CO-Oximeter.

We have recently conducted experimental and clinical studies with the commercial PFC emulsion, Fluosol-DA 20% (2, and unpublished data, W. Perloff). Both groups, working independently, have found the same type of discrepancies in the measurement of percent oxyhemoglobin with the IL282 CO-Oximeter when this PFC emulsion was present in blood: percent oxyhemoglobin values were low and percent methemoglobin values were high. We also measured oxygen content directly with the Lex-O2-Con and found that the oxygen content values were not decreased as would be expected from the values for oxyhemoglobin percent-saturation. We conclude that the performance of the IL282 CO-Oximeter for determining percent oxyhemoglobin is adversely affected by the presence of Fluosol-DA 20%.

Although Sehgal et al. did not specify that the values for percent oxyhemoglobin as measured with the CO-Oximeter were reliable in the presence of Fluosol, this may have been inferred by the readers. We consulted Instrumentation Laboratory regarding the function of the IL282 (personal communication, M. Feil, Instrumentation Laboratory). They first stated that the IL282 was not designed to function in the presence of small dispersions. Secondly, because there is interdependence of the four values reported by the instrument, if one absorbance measurement were affected, all reported values could be affected. Finally, since the instrument was not designed to function with a sample containing an emulsion, there may be significant variation in performance in this respect between individual machines; i.e., one IL282 may function properly in the presence of a PFC emulsion while another IL282 CO-Oximeter may give erroneous results (4).

We recommend that the IL282 CO-Oximeter not be used when a PFC emulsion is present in the blood until the effect of various amounts of PFC emulsion is determined.

References

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