CSF of septic meningitis (7), and the role of NO in permeability changes of the blood-brain barrier in LPS-induced experimental meningitis (8).

Another interesting potential explanation for the present observation is that lipopolysaccharide-s produced by gram-negative bacteria could induce local CRP synthesis in the central nervous system. CRP can be produced in neurons (9), and lipopolysaccharide-s can induce CRP in extrahepatic sites (10). This may also explain the increase, albeit non-significant, in serum CRP in the gram-negative cases.

There is currently no single test to diagnose the etiology of meningitis promptly and accurately. Given its high sensitivity and easy measurability, CRP may be a useful supplement to the diagnosis of meningitis.

References


Letters

Use of Sodium Measurement as a Surrogate Volume Measurement in Unmetered-Blood Collection Devices

To the Editor:

Tanaka et al. (1) describe a new blood-sampling device. Blood is applied to a membrane and travels laterally through the pores of the membrane. The red cells are trapped within the membrane and the serum can be recovered from the red-cell-free area. Some years ago we investigated this approach and encountered two problems. The first problem was hemolysis of red cells, which might interfere in the subsequent measuring process. This rendered measurement of some components (e.g., potassium and lactate dehydrogenase) impossible. Tanaka overcame this problem with the inclusion of sucrose in the membrane. The second problem we encountered was in the determination of the volume of serum extracted from the membrane to allow the use of unmetered-blood collection. Here we describe how we overcame this problem by expressing results relative to the sodium concentration.

We reasoned that because sodium is so tightly controlled among and within individuals that if the concentration of an analyte in blood samples was divided by the concentration of sodium in those samples, the resulting ratio would correlate closely with the original measured concentration of that analyte. If this ratio of analyte to sodium concentration was then multiplied by the mean sodium concentration of the population, the result would be little different from the original measured concentration.

We demonstrated the feasibility of this approach for several analytes in which the measured result was compared with a result calculated on the basis of the analyte/sodium ratio. For 230 consecutive results on patient samples, the mean differences, the SDs of those differences, intercepts, slopes, and correlation coefficients ($r^2$) were the following: for albumin (mean concentration, 35.5 g/L): $-0.069$, $0.87$, $1.00$, $0.98$, $0.984$; for urea (mean concentration, 8.47 mmol/L): $-0.01$, $0.377$, $-0.035$, $1.002$, $0.997$; for alkaline phosphatase (mean concentration, 114 U/L): $0.024$, $4.27$, $-1.14$, $1.013$, $0.999$; and for calcium (mean concentration, 2.30 mmol/L): $-0.005$, $0.0684$, $0.007$, $0.995$, $0.885$. The correlation coefficient was $<0.98$ for only calcium. This was not unexpected because the concentration of calcium in the blood is tightly controlled.

We then demonstrated the applicability of the technique for albumin (a measurement that was not affected by hemolysis of the sample). Unmetered-blood spots of $\sim 30 \mu L$ were applied to the end of a $6 \text{ mm} \times 5 \text{ cm}$ strip of Whatman GF/G6. The blood was left to diffuse up the strip for 5–10 min. After this time, the plasma within the blood sample had migrated further than the red cells. The portion of the strip containing only plasma was cut out with a scalpel and added to 1 mL of cesium chloride (1.5 mmol/L) in a 1.5-mL conical tube, left to stand for 10 min, and then centrifuged at 10 000g in an Eppendorf 5412 microcentrifuge. The sodium concentration in the eluate was measured with an IL 943 flame photometer in the manual mode with sodium calibrators diluted in the same cesium chloride diluent. The albumin in the eluate and plasma from the original samples were 2 Department of Clinical Biochemistry Hadassah Mount Scopus Hospital Hebrew University Hadassah Medical School Jerusalem 91120, Israel

1 Department of Clinical Microbiology Hadassah Mount Scopus Hospital Hebrew University Hadassah Medical School Jerusalem 91120, Israel

*Author for correspondence. E-mail mayer@hadassah.org.il.
was determined with a bromcresol purple method on the IL Monarch. The measured albumin concentration in the eluate was divided by that of the measured sodium concentration and multiplied by 138 (the mean sodium concentration in the population). With this correction factor, the calculated albumin concentration agreed well with the albumin concentration measured in the plasma of the samples (Fig. 1).

The use of sodium measurement appears to be a feasible method for correcting for blood volume in unmetered-blood collection devices. It can be applied to most analytes but is less reliable when applied to analytes such as calcium that are tightly controlled. It is, of course, also not applicable to the measurement of sodium.

References

Gerald A. Maguire*  
C. Nicholas Hales  
Department of Clinical Biochemistry and Immunology  
Addenbrooke’s Hospital  
Cambridge CB2 2QR  
United Kingdom

*Author for correspondence. Fax 44-1223-217794; e-mail gam1004@cam.ac.uk.