Urine Osmolality and Urinary Red Cell Morphology

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Dear Sir,

In their study of the effect of urine osmolality on urinary red cell morphology, Turitzin et al. [1] conclude that red cell lysis occurs at a urine osmolality less than 210 mosm/kg because they were able to demonstrate a left shift in red cell size distribution below this osmolality, and they also demonstrate a normal cell size frequency distribution of erythrocytes incubated in urine with osmolality of 247 mosm/kg.

It is of importance, however, that urine tonicity is considerably less than the osmolality value would suggest because of urinary urea, which, passing freely across cell membranes, does not effect fluid shifts. Although the urea content of urine is diet dependent, the normal range of 450–700 mmol/day [2] indicates that urea contributes substantially to urine osmolality, and a recent study from this department in 105 randomly selected outpatients having urine microscopy performed showed that urine tonicity was only 0.53 ± 0.12 (mean $\pm$ SD) the osmolality value. This compares to other values in the literature, varying between 0.49 ± 0.07 and 0.70 which can be calculated from data of Hulet and Smith [3] and Steinmetz and Smith [4], respectively.

Thus Turitzin et al. have shown a normal red cell size distribution when urine tonicity is presumably in the range 120–170 mosm/kg and a left shift in red cell size distribution when urine tonicity is presumably in the range 105–150 mosm/kg. However, plasma tonicity of approximately 150 mosm/kg causes lysis of 50% of red cells, and plasma tonicity of approximately 110 mosm/kg causes lysis of all red cells [5]. Therefore, although the study has practical implications for evaluation of urinary red cell morphology by cell counter, it seems likely that cell size distribution is not affected until red cell lysis is marked, and the study does not allow the conclusion that red cell lysis occurs only when urine osmolality is less than 210 mosm/kg. To reach this conclusion, the sensitivity of red cell size frequency distribution in detecting red cell lysis needs to be compared to a standard method of measuring red cell lysis.

In addition to an effect of urine concentration on red cell size measured by cell counter, work from this department has shown that reduced urine tonicity affects urine red cell count as determined by phase contrast microscopy, which may explain failure to confirm by microscopy a positive urine dipstick test for blood [6]. Thus, the influence of urine concentration needs to be considered with this method of urine examination also.

References

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