We present an unusual case of a patient presenting with both monocytic leukemia and plasma cell dyscrasia. Of interest, very high concentrations of monoclonal free light chain, Bence Jones protein (BJP), and lysozyme were found in the urine, and identification of lysozyme by immunofixation electrophoresis (IFE) required modification of the usual methods.

An 83-year-old man entered the Veteran Administration Hospital from a nursing home with a complaint of failure to urinate. The patient was being followed for myelodysplastic syndrome. The patient was admitted to the hospital on the basis of dysuria and a low hemoglobin (reference intervals in parentheses) of 53 g/L (135–180 g/L). The white blood cell count was 8.1 × 10^9/L (5–10 × 10^9/L), with 61% monocytes. Pertinent blood chemistry results on admission were as follows: urea nitrogen, 0.9 g/L (0.07–0.22 g/L); creatinine, 0.06 g/L (0.006–0.014 g/L); potassium, 3.4 mmol/L (3.5–5.3 mmol/L); calcium, 0.076 g/L (0.092–0.107 g/L); total protein, 76 g/L (62–82 g/L); albumin, 24 g/L (35–50 g/L); IgG, 30 g/L (7.2–16.8 g/L); IgA, 2.6 g/L (0.69–3.8 g/L); IgM, 0.62 g/L (0.63–2.7 g/L); and k/λ ratio, 0.49 (1.2–2.6). A monoclonal protein had not been detected previously, but results of the serum protein electrophoresis and immunonephelometric analysis performed on admission indicated a monoclonal IgG-λ concentration of ~30 g/L. This profile is most consistent with myeloma. Bone marrow aspirates showed 30–40% monocytes/myeloblasts and 5–10% plasma cells. Radiologic examination, including bone radiography and computed tomography, showed no bone lesions.

Urine chemistry showed 5.8 g protein/24 h (reference values, <200 mg/24 h), with a volume of 1.5 L. The urine protein electrophoresis (UPE) screen showed a paraprotein near the origin in the gamma region. Urinary IFE identified a small monoclonal IgG-λ migrating very close to a large λ-BJP (Fig. 1). The amount of BJP, estimated from the densitometer tracing of the UPE screen, was ~3 g/day. The interpretation of the UPE and IFE was large BJP, most consistent with myeloma. With the UPE screen, another band was observed in the far cathodal region.

Increased lysozyme (EC 3.2.1.17) concentrations have long been known to be associated with monocytic and myelomonocytic leukemias (1), and quantification may be helpful in classification according to the French-American-British system (2). Nevertheless, it was unclear whether the cathodal band represented BJP or lysozyme. Lysozyme is a small molecule (14–15 kDa) with a high isoelectric point (pI 10.5–11.0) (1); it migrates at the cathodal end of the gel on typical agarose protein electrophoresis (3). Like BJP, it readily passes through the glomerulus where it is physiologically concentrated so that large concentrations appear in the urine (4). Furthermore, urine is mechanically concentrated before analysis so that paraproteins become more apparent. As shown in Fig. 1, lysozyme can be observed with UPE in as little as a 25-fold concentrate.

IFE was performed for definitive identification. Lysozyme was not detected by the usual IFE procedure using two different types of IFE plates (Helena Laboratories and Beckman Coulter) because it ran off the cathodal end of the gel. It could be identified (antibodies obtained from Dako) by reducing the time of electrophoresis or by inoculating the gel closer to the anodal end. The advantage of maintaining the same electrophoretic time with inoculation near the anodal end is that samples for routine immunoglobulin identification can be run at the same time. The disadvantage is that the associated UPE does not show all of the banding because albumin and many globulins migrate off of the gel. In either case, these simple manipulations provide a method for definitive identification of lysozyme.

When the procedure is manipulated so that lysozyme...
Circles at the bottom of some strips represent control wells. The solid squares indicate the point of sample inoculation. The arrows indicate the usual spot of inoculation. Circles at the bottom of some strips represent control wells. +, anode.

Fig. 1. UPE and IFE on IFE plates.

The time of electrophoresis is shown at the top. The type of electrophoresis, i.e., UPE or antigen fixed with IFE, is shown just below the time of electrophoresis. The degree of urine concentration is shown below the type of electrophoresis. The solid squares indicate the point of sample inoculation. The arrows indicate the position of lysozyme. The wedge indicates the usual spot of inoculation. Circles at the bottom of some strips represent control wells. +, anode.

The degree of urine concentration is shown below UPE or antigen fixed with IFE, is shown just below the time of electrophoresis. The time of electrophoresis is shown at the top. The type of electrophoresis, i.e., UPE or antigen fixed with IFE, is shown just below the time of electrophoresis. The solid squares indicate the point of sample inoculation. The arrows indicate the position of lysozyme. The wedge indicates the usual spot of inoculation. Circles at the bottom of some strips represent control wells. +, anode.

References