

## Two Cases with Unusual Vancomycin Measurements

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### CASE DESCRIPTION

Patient A was a 68-year-old woman with a history of lymphoplasmacytic lymphoma who presented after several weeks of mucosal bleeding. On admission, her cancer involved 95% of bone marrow cells. She was pancytopenic and febrile (38.3 °C). Leukocyte count was  $0.39 \times 10^3/\mu\text{L}$  (neutrophils,  $0.03 \times 10^3/\mu\text{L}$ ), hematocrit 25%, platelet count  $21 \times 10^3/\mu\text{L}$ , relative serum viscosity 2.3 (reference interval, 1.4–1.8), blood urea nitrogen 6.4 mmol/L (18 mg/dL), creatinine 62  $\mu\text{mol/L}$  (0.7 mg/dL), and estimated glomerular filtration rate  $>60 \text{ mL/min/1.73 m}^2$ . She had an IgM $\kappa$  monoclonal component of 42.8 g/L. This patient was started on vancomycin 1 g intravenously (IV) every 12 h, ceftazidime 2 g IV every 8 h, and a course of chemotherapy. On day 3 after the beginning of antibiotic treatment, a trough specimen was collected for measurement of vancomycin. The concentration, measured with a Beckman Coulter Synchron competitive turbidimetric immunoassay, was  $<0.1 \text{ mg/L}$ . The result, which was incompatible with ongoing vancomycin therapy, signaled a problem to the technologist. No analytical issues were evident upon review of calibration, controls, and results for other chemistry tests performed on the same specimen. In an attempt to resolve an apparent falsely low result, a 1:1 mix of the specimen was made with the Beckman liquid comprehensive control serum (level 3, 30.4 mg/L) and demonstrated near complete recovery (result of mix after adjusting for dilution, 28.6 mg/L). However, a 1:1 mix with pooled patient serum containing vancomycin (11 mg/L) led to only 15% recovery (result of mix after adjustment for dilution, 1.7 mg/L). The specimen was subsequently sent to another laboratory, where a vancomycin concentration of 9.8 mg/L was measured by use of a competitive enzyme-linked immunoassay (Emit, Olympus).

Patient B was a 64 year-old woman with a history of non-Hodgkin lymphoma admitted for stem cell transplantation. Her hospital course included acute renal failure, mental status changes, and disseminated intravascular coagulation. Leukocyte count was  $2.18 \times 10^3/\mu\text{L}$  (neutrophils  $1.79 \times 10^3/\mu\text{L}$ ), hematocrit 28%, platelet count  $7 \times 10^3/\mu\text{L}$ , blood urea nitrogen 23 mmol/L (64 mg/dL), creatinine 160 mmol/L (1.8 mg/dL), and estimated glomerular filtration rate of 22 mL/min/1.73 m<sup>2</sup>. She had an IgM $\lambda$  monoclonal component of 10.0 g/L, with decreased normal gammaglobulins. This patient was started on vancomycin 750 mg IV every 24 h and imipenim-cilastatin 250 mg IV every 8 h for fever of unknown origin (38.2 °C). On day 2, a vancomycin trough specimen was collected just before administration of the second dose. The result was suppressed by the analyzer, which reported “reaction rate high,” i.e., faster than would be seen even in the absence of vancomycin. Calibration, controls, and the day’s vancomycin test results were reviewed and showed no problems. The inappropriate reaction rate repeated with dilution, and also occurred with analysis of 2 other specimens from patient B. The specimen was subsequently sent to another laboratory, where a vancomycin concentration of 6.9 mg/L was measured with a competitive enzyme-linked immunoassay (Emit, Ortho-Clinical).

#### Questions to Consider

- What might have caused the problems in measuring vancomycin observed in these two patients?
- What other laboratory tests might demonstrate interferences for these patients?
- What are the recommendations for monitoring vancomycin?

## Final Publication and Comments

The final published version with discussion and comments from the experts will appear in the March 2009 issue of *Clinical Chemistry*. To view the case and comments online, go to <http://www.clinchem.org/content/vol55/issue3> and follow the link to the Clinical Case Study and Commentaries.

## Educational Centers

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