Analytical evaluation of phenytoin, phenobarbital, valproic acid and vancomycin assays on the Abbott Architect™

Schouwers S[1], Verstraete A[1], Stove V[2]

[1]Toxicology Laboratory, [2]Core Laboratory, Laboratory for Clinical Biology, Ghent University Hospital, Belgium

Introduction: Phenytoin, phenobarbital and valproic acid are anti-epileptic drugs, frequently used in clinical practice. Because of high protein binding, narrow therapeutic range and variable bioavailability, monitoring might be useful. Vancomycin is a glycopeptide antibiotic. Appropriate dosing depends on patient variables (weight, renal function, …) and susceptibility of the pathogen, therefore monitoring is necessary. We evaluated the analytical performance of the Abbott Architect™ assays for monitoring these drugs. All parameters are measured in serum/plasma.

Methods: Accuracy and between-run precision were evaluated based on at least 10 measurements of Abbott Immunoassay-MCC liquid controls (3 levels). Except for valproic acid (n=10), evaluation of within-run precision was calculated by analysing control material 6 times in one run. For all parameters a method comparison with the currently used routine method was performed (Abbott Axsym™).

Results and discussion: At 6.7-23.5 µg/mL phenytoin, bias (n=10) varied between -0.2 and 1.1%; between (n=10) and within-run CV ranges 2.4-2.6% and 1.6-2.4% respectively. At 10.4-51.3 µg/mL phenobarbital, bias (n=12) varied between 2.8% and 8.5%; between (n=12) and within-run CV ranges 1.8-3.8% and 1.4-2.5% respectively. At 41.6-133 µg/mL valproic acid, bias (n=22) varied between -2.9 and 0.5% and between-run CV (n=22) ranges 3.5-4.0%. At 41.8 µg/mL within-run CV is 2.8%. At 7.1-32.5 µg/mL vancomycin, bias (n=11) varied between 0.3-1.3%; between (n=11) and within-run CV ranges 1.9-2.5% and 1.2-2.1% respectively.

Method comparison for phenytoin (n=42) showed that a 12.4% lower result could be expected compared to Axsym™. For phenobarbital (n=34) a 9.9% higher result was obtained compared to Axsym™. For valproic acid a 7.4% and 0.1% higher result was observed compared to Axsym™ for comparison of frozen (n=24) and fresh (n=46) samples respectively. For vancomycin (n=40) a 12.9% higher result was observed compared to Axsym™.

Overall, the analytical performance of the Abbott Architect™ assays is satisfactory. Accuracy and precision are comparable to or better than the currently used methods. Differences found in the method comparison were not considered significant based on an allowable error

of 24%. The method comparison for phenytoin, Phenobarbital, valproic acid and vancomycin was performed on frozen samples and showed higher results on Architect™ compared to Axsym™. Method comparison for valproic acid was also performed on fresh samples and shows no bias between both methods. Freezing of samples might contribute to the observed differences between both methods. Reference values were not adapted.