

Validation of the 'Testmate Che 460' Bedside Kit in the Determination of Red Blood Cell Acetylcholinesterase and Plasma Cholinesterase in Organophosphorus, Carbamate and Unknown Pesticide Poisoning

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Introduction: Monitoring levels of acetylcholinesterase is useful in the management of OP poisoning, but unfortunately the laboratory facilities for this test are currently unavailable in many parts of the world. Testmate ChE 460 is a bedside testing kit developed in the USA to monitor red blood cell acetylcholinesterase (RBC-AChE) and plasma cholinesterase (PChE) in patients who have been occupational exposure to pesticides. This is the first paper reporting the validation of this testing device in human patients with pesticide toxicity resulting from self poisoning. **Aims:** 1. To determine the level of agreement between RBC-AChE and PChE levels measured using the Testmate bedside test when compared with a reference laboratory in patients acutely poisoned by organophosphorus, carbamate or unknown pesticides. 2. To determine the clinical factors that might lead to a lack of agreement. **Methods:** Patients admitted to two general hospitals in Sri Lanka with a history of organophosphorus, carbamate or unknown pesticide poisoning between September 2007 and April 2008 were recruited and the RBC-AChE and PChE levels were measured using Testmate ChE. In addition a duplicate sample was prepared using a previously described method (using dilution and cooling), and this was later analyzed at a reference laboratory using the modified Ellman technique. **Results:** There were 36 patients in the study, with a total of 182 and 147 paired of results for RBC-AChE and PChE respectively. Overall there was good correlation between the Testmate and reference laboratory results (spearman's correlation coefficients 0.83 and 0.74 for RBC-AChE and PChE respectively). There was also good agreement between test results for the different clinical categories of RBC-AChE inhibition (normal, mild inhibition, moderate inhibition, and severe inhibition) as reflected by a weighted kappa [w^2] of 0.76 ($\text{prob} > z = 0.0000$). The Bland Altman analysis showed there was a mean positive bias in the testmate result of 1.5 U/g Hb (sd 7.3, 95% CI -12.8 to 15.9) for RBC-AChE and a negative bias of -0.144 U/l for PChE. **Discussion:** There were systematically lower values of AChE recorded in one hospital when compared with results from the other, which may reflect problems with the storage of samples in this centre. One potential factor in differences seen could be related to the quality of Testmate operation as the test was carried out by junior doctors in the study but was designed to be operated by trained laboratory personnel. **Conclusion:** The Testmate ChE is able to give clinically reliable results in OP, carbamate, and unknown pesticide poisoned patients when operated by medical personnel in a rural hospital setting, and may have further application in the management of pesticide poisoning and toxicological research.