Variance Evaluation on Immunoassay Pre-Diluted Calibrators

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D-dimer is an important biomarker for haemostasis. When testing for d-dimer detection on the clinical lab, the parts involved are the subject sample, the instrument where the test will be performed and the immunoassay. Usually an immunoassay kit is composed by the reagents, the controls and the calibrators. The calibrator is responsible of the instrument calibration, i.e., determine how the sample's observed value is going to be interpreted as amount of D-dimer and then as diagnose for haemostasis diseases.

Biokit's agglutination immunoassays for D-Dimer detection (HemosIL D-Dimer HS and HemosIL D-Dimer HS500) are prepared to be used with the ACL TOP instrument's family (Instrumentation Laboratory Inc.). During the instrument calibration, the ACL TOP instruments automatically prepare the different levels of concentration by diluting the calibrator.

Instrument calibration introduces some variance within the process of sample testing and this variance may be related to the automatic preparation of the calibrator's levels. In this study we have compared the automatic calibration vs. pre-diluted calibrators, looking for an improvement reducing variance.

The study was done for both Biokit's assays, following a Balanced Incomplete Blocks Design (BIBD), with all factors randomized. Factors include 3 types of calibration, 4 samples and 5 different units of instruments, in addition to day, run and replicates. The observed value was obtained from direct measurement and calculated through calibration curve interpolation.

The evaluation of variance for each type of calibration was done by linear mixed models using two different modelling approaches. On each approach, variance estimations were compared in terms of variance, standard deviation and coefficient of variance.

The results indicate slightly improvement, decreasing the total variance when using pre-diluted calibrators, and helped to identify variance contributors to the results when performing this.

Keywords: Linear Mixed Models, Variance, Design of Experiments, Immunoassays.

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