Performance of the automated dicentric and cytokinesis block micronucleus assays in a recent NATO exercise of established biodosimetry methods


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**Aim**

Examine the accuracy of scoring procedures such as manual versus semi-automatic and automatic scoring for well-established cytogenetic assays, namely, the dicentric chromosome assay (DCA) and the cytokinesis block micronucleus assay (CBMN). The automatic scoring allows a much higher throughput of both assays.

**Method**

Lithium-heparinized whole blood from one healthy donor was irradiated (240 kVp, 13 mA, X-ray, dose rate: 1 Gy/min, at ~37°C). Ten blind (and calibration) samples irradiated with single doses between 0 - 6.4 Gy were sent to participants to run their assay (table 1, figure 1). Cell scoring was done manually in triage mode or with new automated methods. Dose estimates provided by the participants were analyzed using a linear model, logistic regression analysis and report time was documented. Preliminary calculation of variances (squared difference between dose estimates and actual dose summed for 10 blind samples and divided by sample number, table 2) provides a measure for precision of each laboratory contribution.

**Results**

Report time for dose estimates of cytogenetic assays was 2.4 - 4 days after receipt of blood samples, which was mainly due to cell culture time. It is the first intercomparison, where automated methods were applied simultaneously with conventional scoring. The dose estimates for various contributions of different laboratories are given in figure 2. The order of corresponding precision (variance, preliminary results) in table 2 show some variability in performance, but it gets obvious that the DCA assay is superior to the CBMN assay, and that the automated methods provide results comparable to the manual scoring procedure. We also merged dose into binary categories of clinical significance (logistic regression, table 3). Dose estimates fell into these categories with equal efficiency for both assays, irrespective of the scoring procedure, except that a 10% decrease in sensitivity was observed for the automated CBMN assay at # > 4 Gy.

**Conclusion**

The automated cytogenetic DCA and CBMN assays are almost as accurate as manual scoring in triage mode. This is also true when merging dose estimates into binary dose categories of clinical significance. Hence, our data support the use of high-throughput automated methods as a screening tool for dose estimation.