

Title	Biological dosimetry following exposure to neutrons in a criticality accident
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Abstract	<p>The aim of the BIONCA project was to implement cytogenetic techniques for biodosimetry purposes in the Nordic countries. The previous NKS-funded biodosimetry activities (BIODOS and BIOPEX) concentrated on experiments using gamma-irradiation and on developing the PCC ring assay for biodosimetry. Experiments conducted during the present BIONCA project has broadened the biodosimetry capacity of the Nordic countries to include dose estimation of exposure to neutrons for both PCC ring and dicentric chromosome techniques.</p> <p>In 2009, experiments were conducted for establishing both PCC ring and dicentric dose calibration curves. Neutron irradiation of human whole blood obtained from two volunteers was conducted in the Netherlands at the Petten reactor. Cell cultures and analysis of whole blood exposed to eight doses between 0 and 10 Gy were performed for both techniques. For the dicentric assay, excellent uniformity in dose calibration for data from both SU and STUK was observed. For PCC rings, the SU and STUK curves were not equally congruent, probably due to the less uniform scoring criteria. However, both curves displayed strong linearity throughout the dose range. In 2010, an exercise was conducted to simulate a criticality accident and to test the validity of the established dose calibration curves. For accident simulation, 16 blood samples were irradiated in Norway at the Kjeller reactor and analysed for dose estimation with both assays. The results showed that, despite a different composition of the radiation beams in Petten and Kjeller, good dose estimates were obtained.</p> <p>The activity has provided good experience on collaboration required in radiation emergency situations where the biodosimetry capacity and resources of one laboratory may be inadequate. In this respect, the project has strengthened the informal network between the Nordic countries: STUK, the Finnish Radiation and Nuclear Safety Authority, NRPA, the Norwegian Radiation Protection Authority and SU, the Stockholm University.</p>
Key words	Biological dosimetry, dose assessment, neutron exposure, PCC ring assay, dicentric chromosome assay