AbstractID: 1092 Title: A Semi-Automated Method For the Detection of Cells From Phase-Contrast Images Used In Alpha-Particle Track-Etch Dosimetry

A novel alpha-particle irradiator has recently been developed which provides the possibility of individual cell dosimetry. The irradiator is comprised of a collimated, planar alpha-particle source which irradiates cells cultured on a track-etch material from below. Cells are imaged using phase-contrast microscopy before and after irradiation to obtain geometric information and survival rates; these can be used with data from alpha-particle track images to calculate individual cell dosimetry. An important step in the process is obtaining cell location within the image. Although this can be done completely by human observer, the number of images requiring analysis makes the process time consuming and tedious. To reduce the chance for error a semi-automated, computer-aided method of cell detection has been developed. This method employs a two level adaptive thresholding technique to obtain size and position information about the bright cytoplasms and dark nuclei. Proximity and geometry-based thresholds are then used to mark structures as cells. False positive detections from the automated method occur mostly due to imperfections in the track-etch background, camera effects, and cellular residue. To correct for these, a human observer reviews all detected structures, discarding false positives. From a database of images the semi-automated method detected 80-94% of all cells and 94-97% of all cells with a defined cytoplasm and nucleus while reducing human workload by 68-95%. Intra- and inter-observer variability introduced a 2-4% difference between structures marked as cells in human-only and computer-aided detection approaches.

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