Novel Biomarkers in Human Blood for Radiation Exposure

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Abstract

Biomarkers to indicate past exposure to radiation have not yet been entirely satisfactory. Using cDNA microarray hybridization to find new potential biomarkers, we identified highly expressed gene in human peripheral blood lymphocytes (PBL) after ex vivo 1Gy irradiation. The present set of radiation markers in PBL was identified 12 h of radiation. Total 44 genes were identified. However, when RT-PCR was performed with mRNA of 5 individual PBL, only 4 genes, including TRAIL receptor 2, DRAL, cyclin G and cyclin protein gene, showed greater than 50% agreement between gene induction detected by microarray and by RT-PCR. When more than 32 donors were tested for the above 4 genes, greater than 85% agreement were obtained between gene induction measured by microarray and by RT-PCR. Furthermore, there was a linear dose-response relationship between 0.5 and 4Gy at 12 hr after irradiation, however, there was less linearity at later times. These results suggested that relative expression levels of genes such as TRAIL receptor 2, DRAL, cyclin G and cyclin protein gene protein in PBL may provide estimates of radiation exposures.