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Gene expression analysis in Mayak workers with occupational prolonged exposure

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Abstract

We evaluated gene expression in the peripheral blood in relation to occupational exposure in Mayak workers. Workers were exposed to either combined internal alpha-radiation from incorporated ^{239}Pu (^{239}Pu burden >0.7 kBq) and external γ-rays (> 1.01 Gy, n=82) or to only external γ-rays (> 0.5 Gy, n=18) to the red bone marrow (n total = 100). Gene expression of the exposed groups was examined in relation to 50 unexposed individuals. RNA was isolated (mirVana Kit, Life Technologies) from peripheral blood aliquots, converted into cDNA and stored at -80°C. For examinations on the transcriptional level we hybridized 40 RNA samples (10 for each of our three exposure groups and the control) on 40 whole genome microarrays (Agilent, 8x44K). For examinations on the posttranscriptional level we measured about 667 different microRNA species simultaneously using qRT-PCR (LDA type A/B, Life Technologies). Candidate genes were assessed by (1) introducing a 2-fold difference in gene expression over the reference group and (2) showing a significant p-value using the Kruskal-Wallis or Man-Whitney tests. From about 40,000 transcripts we selected 376 candidate genes (80 up regulated and 296 down regulated relative to the reference group). Expression of almost all of the genes (70-98%) appeared significantly associated with incorporated ^{239}Pu and to a lesser extend associated with the external γ-rays (2-30%). Associations in the same direction were found for 46 microRNAs. Results of the validation phase (qRT-PCR) will be presented at the meeting.

Biography

Dr. Abendis employed as a Deputy Director at Bundeswehr Institute of Radiobiology affiliated to University Ulm, Germany. He earned a doctor degree in Medicine, a professorship in Radiobiology and a Master of Science in Epidemiology. His current research interest includes long lasting modifications of gene expression in response to ionizing radiation. To gain insight into this research he joins international collaborations merging divergent fields such as molecular biology, medicine, biostatistics and radioepidemiology.