

## **Chronic Inflammation in a Radium Dial Painter Cohort: Elevated Neutrophil to Lymphocyte Ratio and Radiation-induced Hearing Loss**

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The radium dial painters (RDP) are a well-described group of predominantly young women who incidentally ingested  $^{226}\text{Ra}$  and  $^{228}\text{Ra}$  as they painted luminescent watch dials in the first part of the twentieth century. In 1976 pathologist Dr. William D. Sharpe published complete clinical and autopsy results for 42 former radium dial painters evaluated in the New Jersey Radium Research Project (NJRRP). This was an important paper due to the completeness of the observations. Surprisingly, in the NJRRP study, clinicians noted a 35.5% incidence of hearing loss, both conductive and mixed etiologies. Since the 1976 publication, there has developed a considerable literature on radiation-induced hearing loss in patients undergoing radiotherapy for head and neck cancers. Recently, the neutrophil to lymphocyte ratio (NLR) has been shown in many cancer and non-cancer studies to be a nonspecific marker of inflammation. In prior collaborative efforts with the United States Transuranium and Uranium Registries and with the NCRP Million Person Study, it has been possible to evaluate NLR from medical records of a cohort of 166 former radium dial painters previously evaluated at Argonne National Laboratory. These observations have suggested a possible state of chronic inflammation in those patients previously treated for radium-induced osteosarcoma. Revisiting the hematology profiles in the NJ cohort, we find the group NLR to be statistically elevated ( $3.05 \pm 0.28$ ,  $n = 50$ ;  $p = 0.002$ ; Mann-Whitney) from that for modern unirradiated controls ( $2.06 \pm 0.06$ ,  $n = 125$ ). These results are suggestive of chronic inflammation in the NJRRP cohort. The association of radiation-induced inflammation to hearing loss in the RDP cohort warrants additional investigation.

USTUR-0665-23A