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COHORT STUDY OF BERYLLIUM WORKERS: UPDATE AND EXPOSURE-RESPONSE ASSOCIATIONS. *M K Schubauer-Berigan, J R Couch, M R Petersen, T Carreón, Y Jin, J A Deddens (National Institute for Occupational Safety and Health, Cincinnati, OH 45226)

This study extended follow-up through 2005 of cause-specific mortality in a cohort of 9199 male workers at seven beryllium processing plants, and estimated associations with maximum and cumulative daily weighted average beryllium exposure. We estimated standardized mortality ratios (SMRs) based on US population comparisons for lung, nervous system and urinary tract cancers, chronic obstructive pulmonary disease (COPD), chronic renal disease, and categories containing chronic beryllium disease (CBD) and cor pulmonale. We evaluated associations with maximum and cumulative exposure using internally standardized rate ratios for 5436 workers at the three plants with quantitative exposure information. Overall mortality elevations in the seven-plant cohort were found for lung cancer (SMR = 1.17; 95% CI 1.08, 1.28), COPD (SMR = 1.23; 95% CI 1.13, 1.32), and for the categories containing CBD (SMR = 7.80; 95% CI 6.26, 9.60) and cor pulmonale (SMR = 1.17; 95% CI 1.08, 1.26). Mortality rates for most diseases of *a priori* interest increased with increasing latency. For the category including CBD, rates were substantially elevated compared to the US population across all exposure groups. Workers with maximum beryllium exposure $\geq$10 $\mu g/m^3$ had higher rates of lung cancer, urinary tract cancer, COPD, and the category containing cor pulmonale than workers with lower exposure. Significant positive trends with cumulative exposure were observed for nervous system cancers ($p = 0.0006$) and, when short-term workers were excluded, lung cancer ($p = 0.02$), urinary tract cancer ($p = 0.003$), and COPD ($p < 0.0001$). Cigarette smoking and exposure to other lung carcinogens are unlikely to explain these elevations.

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RETROSPECTIVE EXPOSURE ASSESSMENT FOR A COHORT STUDY AT A BERYLLIUM PROCESSING FACILITY. *J R Couch, M R Petersen, C Rice, M K Schubauer-Berigan (National Institute for Occupational Safety and Health Cincinnati, OH)

A job exposure matrix (JEM) was constructed for an epidemiologic study at an Ohio beryllium processing facility and was evaluated for temporal changes in airborne beryllium exposures. Quantitative exposure measurements of airborne beryllium were made between 1953 and 2006 and were used by plant personnel to estimate daily weighted average (DWA) exposure concentrations. We used these DWA measurements to create a JEM with 21 exposure metrics, which we linked to the plant cohort consisting of 18,568 unique job, department, and year combinations. The exposure metrics included quantitative metrics (annual average DWA exposures, maximum DWA and peak exposures), qualitative metrics (chemical beryllium species, and physical form), and qualitative assignment of exposure to confounding exposures. Twelve collapsed job titles with long-term consistent industrial hygiene samples were evaluated using analysis of variance (ANOVA) for time-trends in DWA estimates. The arithmetic DWA mean was 2.15 $\mu g/m^3$and the geometric mean DWA was 1.60 $\mu g/m^3$ for these jobs. After the DWA calculations were log-transformed, eleven of the twelve had a statistically significant ($p < 0.001$) decrease in reported exposure over time. ANOVA of all twelve jobs (analyzed as a group) indicated significant differences among years. Annual arithmetic mean DWA estimates for the JEM by decade ranged from a high of 1.39 $\mu g/m^3$ in the 1950s to a low of 0.33 $\mu g/m^3$ in the 2000s. The constructed JEM successfully differentiated beryllium exposures across jobs and over time. This JEM was combined with two others for use in a cohort study of workers at three beryllium processing facilities.

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AIRLINE PILOT COSMIC RADIATION AND CIRCADIAN DISRUPTION EXPOSURE ASSESSMENT FROM LOGBOOKS AND COMPANY RECORDS. *B Grajewski, M A Waters, L C Yong, C-Y Tseng, Z Zivkovich, R T Cassinelli II (National Institute for Occupational Safety and Health, Cincinnati, OH 45226)

US commercial airline pilots, like all flight crew, are at increased risk for specific cancers, but the relation of these outcomes to specific air cabin exposures such as cosmic radiation and circadian disruption is unclear. Flight time is often used as a surrogate for exposure to cosmic radiation. Our objectives were to develop methods to estimate exposures to cosmic radiation and circadian disruption, and to describe workplace exposures for this group of pilots. Exposures were estimated between August 1963 and March 2003 for 83 pilots from a major US airline, based on over 500,000 individual flight segments as well as summary records from other sources. Pilots flew a median of 7,126 flight segments and 14,959 block hours over 27.8 years of flight experience. In the final study year, a median pilot incurred an estimated effective dose of 1.922 mSv (absorbed dose, 0.846 mGy) from cosmic radiation and crossed 362 time zones. A study pilot was possibly exposed to a moderate- or large-sized Solar Particle Event (SPE) a median of 6 times in their work history, or once every 3.7 years of work. An index of work during the standard sleep interval (SSI travel) also suggested potential chronic sleep disturbance in some pilots. For study airline flights, median segment radiation doses, time zones crossed, and SSI travel increased markedly since the 1990s. Dose metrics were moderately correlated with questionnaire-edited self-reported flight experience (Spearman r = 0.66 – 0.69). This detailed assessment of individual flight segments is likely to decrease exposure misclassification in flight crew health studies.

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ARE NEWLY-REPORTED LUPUS AND RHEUMATOID ARTHRITIS ASSOCIATED WITH US MILITARY DEPLOYMENT IN SUPPORT OF THE OPERATIONS IN IRAQ AND AFGHANISTAN? *K Jones, N Granado, B Smith, D Slymen, M Ryan, E Boyko, G Gackstetter, T Smith (Naval Health Research Center, San Diego, CA 92106)

Introduction: Traumatic stressors experienced during combat deployments introduce a unique set of risk factors for military service members. Although stress is hypothesized to increase the risk of autoimmune disease, little is known regarding the association between military deployment and the incidence of lupus and rheumatoid arthritis. Our objective was to assess the association between deployment status and newly-reported lupus and rheumatoid arthritis. Methods: A representative sample of multiservice active-duty and Reserve/National guard members was invited to participate in the 21-year longitudinal Millennium Cohort Study. A total of 77,047 Panel 1 (2001-2003) and 31,110 Panel 2 (2004-2006) participants completed the baseline questionnaire and were resurveyed at 3-year intervals. The generalized estimating equation method was used to longitudinally assess the adjusted association between deployment and new-onset of lupus and rheumatoid arthritis. Results: The occurrence of newly-reported lupus was 0.2% in nondeployers, 0.1% in deployers without reported combat exposure and 0.1% in deployers with reported combat exposure. Newly-reported rheumatoid arthritis was identified in 1.9% of nondeployers, 1.2% of deployers without reported combat exposure and 1.8% of deployers with reported combat exposure. Conclusion: The proportion of newly-reported lupus and rheumatoid arthritis differs between nondeployers and deployers with and without reported combat exposures. Adjusted associations are currently being examined using longitudinal analyses.