Abstracts

Oral 12

Radiation

O12.1 RADIATION EXPOSURE FROM WORK RELATED MEDICAL X RAYS AT THE PORTSMOUTH NAVAL SHIPYARD

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Introduction: Previous analyses suggest that worker radiation dose may be significantly increased by routine occupational x ray examinations. Medical x ray exposures for 570 civilian workers employed at the Portsmouth Naval Shipyard (PNS) at Kittery, Maine were estimated to determine the contribution of work related chest x ray (WRX) relative to conventional workplace radiation sources.

Methods: Methods were developed to estimate absorbed doses to the active (hematopoietic) bone marrow from x ray examinations and workplace exposures using data extracted from worker dosimetry records (8468) and health records (2453). Misclassification from the omission of occupational x ray examinations was evaluated and dose distributions were examined for radiation and non-radiation workers.

Results: Photofluorographic chest examinations resulted in 82% of the dose to active bone marrow from medical x ray sources. On average, radiation monitored workers received 25% of their dose from WRX and received 45% more WRX exposure than non-radiation workers.

Conclusions: WRX can result in a significant fraction of the total bone marrow dose, especially for radiation workers who were more likely to be subjected to routine medical monitoring. Omission of WRX from the exposure assessment can cause misclassification, which may attenuate the risk for cancers induced by workplace exposures.
no excess for all causes mortality (SMR = 1.02; 95% CI 0.97 to 1.07). A significant excess of cancer mortality was found (540 observed deaths, SMR = 1.18; CI 1.08 to 1.28) depending mainly of an excess of lung cancer (193 observed deaths, SMR = 1.42; CI 1.21 to 1.66) and kidney cancer (19 observed deaths, SMR = 1.90; CI 1.14 to 2.97). No excess was observed for other causes of death except for silicosis (23 observed deaths, SMR = 7.11; CI 4.50 to 10.67).

Conclusion: The excess of kidney cancer has not been observed in previous analysis and should be analysed in more details regarding potential risk factors. This analysis confirms the existence of an excess risk of deaths from silicosis and lung cancer. The analysis of the association of risk with radon exposure and other occupational hazards is ongoing. Compared to other miners cohorts, the long duration of follow up will allow a detailed analysis of the age related risk of death.

**Mortality Among French COGEMA Workers Monitored for External Ionising Radiation Exposure**

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**Introduction:** This study analyses the mortality of a 9287 nuclear workers cohort employed at the French nuclear company COGEMA. It consists of workers hired for more than one year between 1976 and 1994 and monitored for external ionising radiation.

**Methods:** Administrative data, individual x and gamma ray exposure, and vital status were reconstructed for each worker. As a first stage, standardised mortality ratios (SMR) were computed to compare the mortality of COGEMA workers with the French national population. As a second stage, trend tests were computed to assess the correlation between mortality and radiation exposure.

**Results:** Of the 9287 workers, 93% were men. Workers were followed up for an average of 13 years for a total number of person-years of 120 606. The percentage of subjects lost to follow up was less than 1%. 441 deaths occurred during the follow up period. 96% of the causes of death were identified. The mean cumulative dose among the whole cohort was 15.1 mSv and 27.6 mSv among exposed workers. A strong healthy worker effect was observed for all causes of death (SMR = 0.58; 90% CI 0.54 to 0.63) and for cancer mortality (SMR = 0.74; 90% CI 0.66 to 0.83). No significant excess was found for any of the considered causes of death. A significant dose-effect relation was observed for lymphomas (200–203 ICD 9, p = 0.03 for eight deaths). This result is mainly due to the dose-effect relation found for non-Hodgkin's lymphoma (p = 0.001 for four deaths). For this disease, no link with ionising radiation was found in the literature.

**Conclusion:** COGEMA workers exposed to ionising radiation have a lower mortality than the French national population. An extension of the follow up is ongoing, which will increase the statistical power of this study.