Mustard gas exposure causing death due to respiratory tract cancer and chronic bronchitis in the long term

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Background: The defunct Japanese Army operated a factory producing mustard gas from 1929 to 1945 in Okuno-jima, Hiroshima, Japan. A previous epidemiologic study demonstrated a high incidence of respiratory tract cancer, liver cancer, and chronic bronchitis among former workers of this gas factory. However, the risk factors associated with incidence of various diseases were not well evaluated, and the long-term effects of mustard gas are unclear. Aim: This study aimed to elucidate the long-term effects of mustard gas, which caused carcinogenesis and respiratory diseases in the factory workers, ultimately leading to death. Methods: We retrospectively collected the data of 2,395 male former workers who were employed in the gas factory in Okuno-jima from 1929 to 1948 and followed them up until 2009 to ascertain their vital status and causes of death. Standardized mortality ratios (SMRs) for major causes of death were calculated. Multiple Cox regression models were designed to examine the relationship between mustard gas exposure and each cause of death. Results: The SMR was 132 for all cancers, 211 for respiratory tract cancers, 166 for liver cancer, 133 for respiratory diseases, and 473 for chronic bronchitis. Multivariate Cox proportional hazard analysis showed that a higher risk for mustard gas exposure and longer duration of employment were independently associated with a higher risk of death from respiratory tract cancer and chronic bronchitis. Conclusion: Our long-term follow-up data suggest that occupational exposure to mustard gas is associated with an increased risk of death from respiratory tract cancer and chronic bronchitis.