

# A cohort mortality study among titanium dioxide manufacturing workers in the United States.

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Although titanium dioxide (TiO<sub>2</sub>) is generally regarded as a nontoxic mild pulmonary irritant, some laboratory studies have reported lung adenomas in rats exposed to high levels of TiO<sub>2</sub>. Limited data on health effects among humans exist. A retrospective cohort mortality study was conducted among 4241 TiO<sub>2</sub> workers who were employed for at least 6 months, on or after January 1, 1960, at four TiO<sub>2</sub> plants in the United States. Exposure categories, defined by plant, job title, and calendar years in the job, were created to examine mortality patterns in those jobs where the potential for TiO<sub>2</sub> exposure is greatest. Standardized mortality ratios (SMRs) and their 95% confidence intervals (CI) were calculated to compare the mortality pattern of the workers with the general background population. Relative risks were estimated and trend tests were conducted to examine risk of disease among different exposure level groups in internal analyses. Workers experienced a significantly low overall mortality (SMR = 0.8; 95% CI = 0.8-0.9). No significantly increased SMRs were found for any specific cause of death. Deaths from lung cancer were as expected, and SMRs for this cancer did not increase with increasing TiO<sub>2</sub> levels. Workers in jobs with greatest TiO<sub>2</sub> exposure had significantly fewer than expected total deaths (SMR = 0.7; 95% CI = 0.6-0.9). Internal analyses revealed no significant trends or exposure-risk associations for total cancers, lung cancer, or other causes of death. Results from our study indicate that the exposures at these United States plants are not associated with increases in the risk of death from cancer or other diseases. Moreover, workers with likely higher levels of TiO<sub>2</sub> exposure had similar mortality patterns to those with less exposure, as internal analyses among workers revealed no increase in mortality by level of TiO<sub>2</sub> exposure.

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