Does Hexavalent Chromium in Welding Fumes Cause Increased Lung Cancer Risk in Stainless Steel Welders?

Inhalation of hexavalent chromium (CrVI) is associated with increased lung cancer risk in several occupations, most notably chromate production workers. While stainless steel (SS) welders are also exposed to CrVI in welding fumes, there appears to be no confirmed association between exposure to CrVI in welding fumes and lung cancer. To evaluate the evidence for an association between CrVI in SS welding fumes and lung cancer risk, we performed an integrated analysis using different sources of information. We analyzed welding epidemiology studies that evaluated: 1) lung cancer risk in SS welders; and 2) potential differences in lung cancer risks among SS welders (exposed to welding fumes containing CrVI) compared to mild steel (MS) welders (exposed to welding fumes containing very little CrVI), also considering the adequacy of control for smoking, a known risk factor for lung cancer. To better understand potential differences in the mode of action for CrVI-induced lung cancer in chromate workers compared to SS welders, we analyzed: 1) differences in particle solubility for CrVI from chromate production in comparison to CrVI from SS welding fumes; and 2) the extent to which the specific occupational CrVI exposure leads to respiratory tissue damage. Overall, the epidemiology evidence fails to show an elevated risk for lung cancer incidence or mortality among SS welders compared to MS welders, suggesting that CrVI is not the etiologic agent for increased lung cancer risk in welders in general. The evidence also suggests an association between respiratory tissue damage and lung cancer for chromate workers, and minimal respiratory tissue damage for SS welders. We propose that the difference between the presence of CrVI-related lung cancer risk in chromate workers and its apparent absence in SS welders may be due, in part, to exposure to more soluble forms of CrVI from welding fumes compared to less soluble forms of CrVI particulates from chromate production, and to a greater extent of respiratory tissue damage from chromate production versus SS welding.