Exposures in Dental Clinics Potentially Contributing to Asthma and Interstitial Lung Disease Among Dental Personnel

B. Blackley, J. M. Cox-Ganser, M. Virji; Respiratory Health Division, NIOSH, Morgantown, WV, United States.

RATIONALE: Dental personnel (DP) perform tasks that potentially generate gases, vapors, and dusts associated with occupational lung disease. Historically, dentistry was not considered a high-risk occupation because exposures were not considered life threatening. However, many dental procedures generate vapors and dusts that can contribute to pneumoconiosis, asthma, chronic beryllium disease, and lung cancer. Additionally, a recent report on a cluster of idiopathic pulmonary fibrosis (IPF) among DP noted the number of dentists was 29-times higher than expected. A defining feature of IPF is it is an interstitial lung disease (ILD) without a known cause. Despite a need for comprehensive exposure assessments in dental settings to inform epidemiologic studies and exposure mitigation strategies, few assessments have measured task-based or full-shift exposures to gases, vapors, and dusts that can contribute to work-related lung disease such as work-related asthma and ILD among DP. METHODS: We aimed to perform exposure assessments at 30 dental clinics and laboratories across different specialties and settings. To date, we have performed assessments at seven dental clinics and laboratories, with specialties including general dentistry, periodontics, prosthodontics, orthodontics, and endodontics. Full-shift samples for respirable dust, silica, metals, and volatile organic compounds (VOCs) were collected in dental clinics and laboratories. Real-time instruments were used to measure respirable aerosol size distribution and concentration during dental procedures along with task-based and full-shift time-integrated area monitoring of ultrafine particle size, elemental composition, and concentration. RESULTS: Preliminary results indicate that respirable aerosol concentrations and composition, and VOCs (including asthmagens and carcinogens), vary by clinic specialty. Respirable metals observed in full-shift samples included aluminum, arsenic, cadmium, cobalt, nickel, silver, strontium, tin, zinc, and zirconium, with highest concentrations for most metals observed in prosthodontics. Electron microscopy analyses of task-based samples indicate the presence of silica as well as various metals, including silver, zinc, copper, chromium, and nickel, during various prosthodontic and orthodontic procedures and laboratory tasks. CONCLUSIONS: Our study is ongoing and additional assessments are planned for the upcoming two years. However, our preliminary data indicate differences in aerosol concentrations and composition across different dental specialties. Further, some dust constituents observed in task-based electron microscopy and full-shift samples have been previously observed in lung biopsies of DP with ILD in other studies. Our results can be used to inform (1) job- and task-based exposure matrices in future epidemiologic studies to assess associations between respiratory health and occupational exposures among DP and (2) exposure mitigation strategies.

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