

Grant Number: AFCTG20-98

Title: Rheumatoid Arthritis in Hard Rock Underground Miners

Organization: University of California, San Francisco

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Partnerships: Davis Research

Focus Area: Injury and Disease Exposure and Risk Factors: Musculoskeletal Disorders

SYNOPSIS

Problem Statement. Multiple studies have shown that occupational exposure to mineral dust is strongly associated with increased risk of rheumatologic disease. Rheumatoid arthritis (RA) is the condition most strongly linked to mineral dust inhalation. In the early 1950s, there were nearly simultaneous observations that both silica dust (silica “flour”) and coal mining work were associated with RA. By the 1990s, researchers implicated silica in a range of autoimmune diseases. Mining has been a key source of exposure risk for rheumatologic disease through mixed coal dust-silica. Our own Alpha Foundation-supported research has been a major contributor to a renewed appreciation of this problem in coal mining, paralleling the re-emerging recognition that coal dust (with likely silica co-exposure) represents an important factor in a range of conditions, collectively referred to as “coal mine dust lung disease.” Despite the incontrovertible presence of excess silica dust overexposure in hard rock miners, as opposed to coal miners, the specific risk of RA in such miners has been understudied worldwide and virtually un-researched altogether in the U.S.

Research Approach. This proposal relates directly to and builds upon the innovative work that we performed in our Alpha-supported coal mining studies. Those studies have successfully employed a population-based random-digit-dial structured survey to ascertain coal mining work exposure in the Appalachian region. This research approach took advantage of National Institute for Occupational Safety and Health (NIOSH) mortality maps showing counties with elevated coal worker pneumoconiosis (CWP) mortality rates in selected counties in Appalachia. We will use a parallel approach to identify counties in the western U.S. with NIOSH-reported elevated silicosis mortality rates. We will carry out a population-based survey among 2000 males aged 50-70 with any history of labor force participation (the same demographic criteria as our coal mining surveys). We will use a telephone administered structured questionnaire to gather the study data. We will structure data collection using the basic format of our validated questionnaire, eliciting demographics; key occupational exposures, emphasizing sources and duration of probable silica inhalation; and symptoms and diagnosis of, and treatments received for, RA. We will estimate the relative risk of RA and the population attributable risk associated with past employment in underground hard rock mining.

Impact of the Research. This research addresses an important knowledge gap in miners' health by studying inflammatory arthritis, specifically RA, as an occupational disease. We will be well-positioned to disseminate these findings widely, in particular targeting rheumatologists who evaluate and treat these conditions but currently have little awareness of their association with hard rock mining work. This position has been reinforced by our major peer-reviewed publication already well disseminated: Schmajuk G, Trupin L, Yelin E, Blanc PD. Prevalence of Arthritis and Rheumatoid Arthritis in Coal Mining Counties of the United States. (*Arthritis Care Res* 2019; 71:1209-15). The interest of rheumatologists from coal mining regions in our pilot study findings led many of them to participate in our current study by enrolling persons with RA into the study, indicating that the proposed study may also garner the interest of rheumatologists in the effect of hard rock mining on rheumatologic disease.