

**Grant AFC618SP-88:** Coal Mining Employment as a Risk Factor for Rheumatoid Arthritis

**Previous Grant AFC618-04:** Coal Mining Risk of Arthritis, Including Auto-Immune Rheumatologic Disease

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**Focus Area:** Musculoskeletal Disorders

### **Executive Summary**

Arthritis rates among adult males are higher in states with large numbers of coal miners, West Virginia having the highest prevalence nationwide and Tennessee and Kentucky ranking third and fourth, respectively. The cause of the high rates of arthritis has not been established nor has the extent to which excess disease reflects degenerative arthritis (also called osteoarthritis, the dominant form of the condition) or inflammatory/ autoimmune arthritis of which rheumatoid arthritis is the most common form. The geographic clustering of rheumatoid arthritis in coal mining areas is consistent with the suspected links between coal and silica dust and such disease; the known ergonomic demands of coal mining employment are consistent with increased risk of work-related degenerative arthritis as well as worsening of existing autoimmune arthritis.

Our Alpha-supported exploratory study of arthritis in Appalachia addressed preliminary questions of how much of the risk of disease is linked to coal mining work. Our innovative study gathered data from a specially designed random digit dial (using both landline and cellular phone sampling) population-based telephone survey. The survey recruited 973 men aged 50 and over with a history of labor force participation who reside in coal mining areas. We targeted persons living in Appalachia (selected counties in Kentucky, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia) with historically high mortality rates from coal workers' pneumoconiosis (CWP) based on data from the National Institute for Occupational Safety and Health (NIOSH). Coal mining was associated with more than double the odds of all arthritis (OR 2.2; 95% CI, 1.6, 3.1). Exposure to a high burden of ergonomic factors also was associated with increased odds of arthritis (OR 1.5; 95% CI 1.1-2.0). The odds ratio for rheumatoid arthritis (RA) associated with coal mining was even higher, 3.5 (95% CI 2.0, 6.0). Altogether, coal mining accounted for 19% of all the arthritis and 33% of all the RA in the population studied. The findings from our exploratory study have addressed our initial Study Aims to delineate risk factors for degenerative and autoimmune arthritis in geographic areas with a high burden of CWP and provided strong support for our Study Hypothesis that coal mining employment is a major risk factor for such disease. These findings underscore the value and importance of the second phase study that we now propose.

In our Second Phase study, we propose to carry out further random population sampling and also to recruit a subset of participants with well-characterized RA. We will recruit an additional 2000 males age 50 years or older in the same high CWP counties from which enrollment was drawn in our exploratory study. We will administer a questionnaire that will contain all of the same items as in the original survey, but in addition, will also include items providing supplemental information on work-related exposures in coal mining and other trades as well as additional data on arthritis disease treatments and outcomes. Thus, we will be able to analyze the new data (n=2000) and also to combine the core survey responses with the pilot data (n=973). We will also further build on the pilot study by studying a cohort of patients (n=75) with rheumatoid arthritis and closely aligned inflammatory arthritis conditions recruited from rheumatology specialists practicing in the

Appalachian region. We will leverage these through a 1:4 matched case-referent analysis drawing the referents from the population survey (for case referent study, total n=375). The rheumatologists will obtain patient consent to provide the study with data collected as part of clinical care to confirm the physician diagnosis of RA and identify the year of diagnosis, serological characteristics (presence of antibodies for rheumatoid factor and cyclic citrullinated peptide), and presence of radiographic erosions. The patients will also be asked to consent to contact for a telephone interview that will be identical to that used for the population sample.

This Second Phase study will triple the population survey and add an entirely new case-referent study component. We will have strengthened analytic power to address potential interactions among risk factors. Expanded survey questionnaire will allow refinement in exposure and disease outcome assessment. Rheumatology specialist-confirmed case recruitment will overcome the limitations of only having self-reported disease for risk estimation. After data collection and analysis, we will disseminate these findings widely, targeting in particular rheumatologists who evaluate and treat arthritis but currently have little awareness of the association of coal mining with either degenerative or rheumatoid arthritis.