

Allegheny-Singer Research Institute

Annual Progress Report: 2012 Formula Grant

Reporting Period

July 1, 2013 – June 30, 2014

Formula Grant Overview

The Allegheny-Singer Research Institute received \$79,614 in formula funds for the grant award period January 1, 2013 through December 31, 2014. Accomplishments for the reporting period are described below.

Research Project 1: Project Title and Purpose

Outdoor Air Pollution, Airway Inflammation and Acute Exacerbations of Asthma – The specific aim of this project is to characterize the relationship between levels of indoor and outdoor air pollution (OAP) and lower airway inflammation in patients with acute asthma exacerbations.

Anticipated Duration of Project

1/1/2013 – 12/31/2014

Project Overview

The specific aim of this project is to characterize the relationship between levels of indoor and outdoor air pollution (OAP) and lower airway inflammation in patients with acute asthma exacerbations. The project will consist of a single visit. One hundred six total subjects will be recruited as follows for enrollment into one of three groups:

Acute asthma exacerbation group (n=40): Subjects will be recruited from the pool of patients seeking acute treatment for an asthma exacerbation at an emergency department associated with West Penn Allegheny Health System (WPAHS).

Stable asthma group (n=33): Subjects will be recruited from the pool of patients presenting to an outpatient asthma/allergy clinic associated with WPAHS for routine follow-up for their asthma.

Environmental control group (n=33): Subjects will be recruited at an emergency department associated with WPAHS. Subjects will be either 1) a family member of an acute asthma subject who is with the acute asthma subject in the emergency department on the date of presentation, or 2) they will be another individual presenting the same day as the subject with acute asthma at the same emergency department.

Eligible subjects will complete a demographic survey, respiratory survey, measurement of

fractional exhaled nitric oxide (FeNO), and spot urine collection for measurement of urinary cotinine levels. In addition, in the acute asthma group, a clinical assessment of severity of exacerbation will be performed. These data will be combined with local OAP and weather data (temperature) over the preceding 7 days to construct a model for the relationship between airway inflammation, airborne pollution and acute exacerbation, controlling for the above potentially confounding variables.

Principal Investigator

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Other Participating Researchers

Arvind Venkat, MD – employed by Allegheny-Singer Research Institute
Albert Presto, PhD – employed by Carnegie Mellon University
Gajanan G. Hegde, PhD; Jennifer Shang, PhD– employed by University of Pittsburgh

Expected Research Outcomes and Benefits

The results of the project are expected to show an association between levels of outdoor air pollution and lower airway inflammation in patients with acute asthma exacerbations. It is anticipated that these results will be used as preliminary data in a future NIH application to evaluate the impact of different interventions on these outcomes. The long term goal of this research is to prevent or attenuate acute respiratory exacerbations in patients exposed to outdoor air pollution.

Summary of Research Completed

During the current reporting period, we have concentrated our efforts on enrollment of subjects into our study. We have made excellent progress towards our recruitment goals in each of our three patient groups, enrolling a total of 102 subjects. In the acute asthma exacerbation group, in which subjects are recruited from the pool of patients seeking acute treatment of an asthma exacerbation at an emergency department associated with the Allegheny Health Network (AHN), we have enrolled 39 subjects (recruitment goal: 40 subjects). In the stable asthma group, in which subjects are recruited from the pool of patients presenting to an outpatient asthma/allergy clinic associated with AHN for routine follow-up care for their asthma, we have enrolled 30 patients (recruitment goal: 33 patients). In the environmental control group, in which subjects are recruited at an emergency department associated with AHN and are either 1) a family member of an acute asthma subject who is with the acute asthma subject in the emergency department on the date of presentation, or 2) another individual presenting the same day as the subject with acute asthma at the same emergency department, we have achieved our recruitment goal of 33 patients.

See Table 1.

Since subjects in the current study are enrolled by multiple research groups at multiple locations, we have held a series of regular “check-in” meetings among investigators and research staff in the emergency department and the outpatient asthma/allergy clinics which are participating in this study. These meetings have focused on development and implementation of efficient procedures for enrolling study subjects, collecting and transporting of biological samples, and completing of study visits. These meetings have been beneficial in ensuring that study visits are being conducted appropriately per the research protocol and that all data collected are valid and reliable.

Per the research protocol submitted to the Department of Health, all subjects enrolled into the study have completed a demographic survey, respiratory survey, and measurement of fractional exhaled nitric oxide (FeNO), and have provided a spot urine sample for measurement of urinary cotinine levels. Buccal and nasal swabs have been collected from all subjects and are being stored for potential future analyses of the effects of genetic polymorphisms and identification of respiratory viruses; separate funding will be sought in the future to complete these analyses. Additionally, subjects in the acute asthma group have undergone an assessment of severity of asthma exacerbation. All subjects enrolled in the study, regardless of study group, have completed all assessments per the study protocol.

In addition to enrolling subjects and completing study visits, we have also made excellent progress in collecting outdoor air pollution (OAP) data during the current reporting period. Dr. Albert Presto’s group (Dr. Presto is a consultant on the current project) has used a proprietary mobile atmospheric sampling unit as well as a stationary reference site to collect OAP levels for the zip codes in which subjects in the current study reside. OAP parameters collected include black carbon, particulate matter, particle bound polycyclic aromatic hydrocarbons, nitrogen oxides, ozone, and the air toxins benzene and toluene. Upon completion of all study visits and entry into the data analysis phase of the project, OAP data from each subject’s zip code over the seven days preceding the subject’s visit will be utilized to construct a model for the relationship between airway inflammation, airborne pollution, and acute asthma exacerbations. During the current reporting period, Dr. Presto’s team has built upon data collected in 2013 and has collected OAP data for the majority of Allegheny County, including complete coverage of all zip codes represented by subjects currently enrolled in the study. Upon enrollment of the remaining subjects, if it is determined that any newly enrolled subjects reside in a zip code for which OAP data have not yet been collected, the mobile unit will be utilized to collect OAP for the zip code in question. Dr. Presto will work closely with the research team at AHN and the study’s statistical consultants to analyze the resulting OAP data, specifically contributing to analyses of the relationship between OAP and acute asthma exacerbations in each of our three experimental groups.

As subjects are enrolled and study visits are completed, we have continued to enter data in real time into the study’s secure database. Clinical, demographic, and laboratory data have been entered into our database by study staff using appropriate data entry procedures. No issues have been encountered in expeditiously obtaining completed case report forms from our collaborators

in the Emergency Department and entering data for these subjects. Access to the study database remains restricted only to authorized study personnel.

Having made great progress toward completion of our enrollment goals, including completing enrollment of all subjects in the environmental control group, we anticipate that completion of enrollment of the remaining four subjects during the next reporting period will be brisk. As demonstrated by our robust enrollment numbers to date, successful strategies have been implemented to identify and recruit eligible study subjects. We see large numbers of patients presenting with acute asthma exacerbations in our Emergency Department, and we have a large pool of asthma patients in our outpatient asthma/allergy clinic from which to draw for the current study. We will continue to implement processes for recruitment that have proven successful to date. We have a long history of successful completion of clinical research studies in both our Emergency Department and our outpatient asthma/allergy clinics, and we do not foresee any issues with completing subject enrollment or with completing all study-related procedures and analyses.

We have begun to use our experience with the current study as a springboard to development of future research directions and “next steps.” We anticipate that the results of the current study will serve as the basis of future grant applications to the NIH and asthma foundations. As we move forward with analysis of our study data, we will solidify plans for developing future grant applications.

In summary, during the current reporting period we have 1) increased our overall enrollment to 102 subjects towards our overall goal of 106 subjects, including completion of enrollment of all subjects in our environmental control group; 2) completed study visits for all subjects enrolled; 3) collected OAP data for all zip codes represented by subjects enrolled in our study to date; 4) continued to hold regular study team meetings to review study progress, discuss issues, and develop plans for completion of the study; and 5) begun to develop plans for continuation of the line of research being pursued with the current project, including development of plans to seek future research funding.

Table 1. Enrollment summary as of June 30, 2014.

| Group | Current enrollment | Enrollment goal |
|---------------------------|--------------------|-----------------|
| Acute asthma exacerbation | 39 | 40 |
| Stable asthma | 30 | 33 |
| Environmental control | 33 | 33 |