

## Update

# Polycythemia Vera Research in Pennsylvania— Schuylkill, Luzerne, and Carbon Counties

September 2012

## Purpose

This fact sheet provides an update on 18 projects aimed at understanding more about the higher than normal amount or “cluster” of polycythemia vera (PV) cancers in the tri-county area of Schuylkill, Luzerne, and Carbon Counties, Pennsylvania.

## Background

In 2004, using state cancer registry records, the Pennsylvania Department of Health (PADOH) found a PV cluster in northeast Pennsylvania. In 2006, the federal Agency for Toxic Substances and Disease Registry (ATSDR) was asked to help study PV patterns in the area. From 2007-2008, ATSDR reviewed medical records, conducted genetic testing, and confirmed this PV cluster.

In 2009, Congress funded ATSDR to continue this investigation. ATSDR is overseeing 18 projects with PADOH, the Pennsylvania Department of Environmental Protection, and various universities and private organizations.

These projects are based on recommendations from an expert panel. The panel identified four areas for investigation: epidemiology, genetics, toxicology, and environmental analysis. Fieldwork for the projects is expected to be completed in fall 2012. The findings and reports will be presented at future public meetings as researchers complete data review and analysis.

## Diseases that make too many blood cells

PV is part of a disease group called myeloproliferative neoplasms (MPN), which is a group of slow-growing blood cancers where the bone marrow makes too many red blood cells, white blood cells, or platelets.

Normally, the bone marrow makes blood stem cells (immature cells) that become mature blood cells over time. A blood stem cell may become a myeloid stem cell or a lymphoid stem cell. A lymphoid stem cell becomes a white blood cell. A myeloid stem cell becomes one of three types of mature blood cells:

- Red blood cells that carry oxygen and other substances to all tissues of the body.
- White blood cells that fight infection.
- Platelets that form blood clots to stop bleeding.

In myeloproliferative disorders, too many blood stem cells become one or more types of blood cells. Usually, the disorder slowly gets worse as the number of extra blood cells increases.

ATSDR's investigators hope to find out more about these disorders:

**Chronic myelogenous leukemia (CML)** is a slowly progressing disease in which the bone marrow makes too many white blood cells.

**Essential thrombocytosis (ET)** is an uncommon disorder in which the body produces too many blood platelets (thrombocytes). The most common symptoms of ET are headache, lightheadedness, vision changes, and tingling (numbness or burning pain the hands and feet).

**Polycythemia Vera (PV)** is a rare illness that causes the body to make too many red blood cells, causing the blood to thicken. The extra blood cells can lead to abnormal bleeding, blood clots, strokes, and heart attacks.

**Primary myelofibrosis (PMF)** is a progressive, chronic disease in which excessive scar tissue forms in the bone marrow. This makes it hard for the bone marrow to produce normal blood cells.

## Project Descriptions

ATSDR is conducting 18 projects in partnership with universities, private companies, and state agencies. These projects are based on recommendations from an expert panel that identified four areas for investigation:

- Epidemiology
- Genetics
- Toxicology
- Environmental analysis

### Epidemiology

#### **Comparative epidemiologic study** — *University of Pittsburgh*

*Purpose:* This study is comparing the pattern of PV in an area of Pennsylvania where people have similar characteristics (such as age and race) to people in the tri-county area. The study is being conducted in Blair, Somerset, Cambria, and Bedford Counties in southwest Pennsylvania.

*Milestones:* Recruitment is complete: 77 participants enrolled. An expert panel is reviewing the results.

## **Enhancement of physician reporting of hematologic cancers** — *CDC's National Program of Cancer Registries*

*Purpose:* This study aims to improve doctors' reporting of PV and other blood cancers to central cancer registries. CDC funded three state cancer registries to evaluate and improve reporting by doctors' offices of PV and other reportable blood cancers. The project evaluates current diagnoses and reporting practices, increases physician awareness of reporting requirements and processes, and builds an infrastructure for electronic reporting of hematologic cancers from hematology practices.

*Milestones:* All three states have completed case identification. The cases are undergoing internal quality control. Data analysis is ongoing.

## **Patterns of MPN diagnosis, reporting and care** — *Geisinger Health Systems*

*Purpose:* The MPN diagnosis study is reviewing files of MPN patients to determine how PV, ET, and PMF cases are diagnosed and the accuracy of the diagnosis.

*Milestones:* Data gathering is complete. Statistical analysis is underway. A scientific article will be submitted for publication.

## **Physician education** — *Geisinger Health Systems*

*Purpose:* The physician education project will enhance physician training and education on the diagnosis, reporting, and treatment of PV and other MPNs.

*Milestones:* This project is complete. Information about the outreach completed is available from ATSDR (see contacts at the end of this factsheet).

## **Tri-county area case control study** — *Drexel University*

*Purpose:* This study aims to identify risk factors that might be linked to developing PV, ET, and PMF in the cluster area.

*Milestones:* Recruitment is complete: 55 people with an MPN (cases) and 473 people without (controls) have enrolled. An expert panel is reviewing medical records for accuracy.

## **Tri-county MPN surveillance** — *University of Pittsburgh*

*Purpose:* The surveillance study aims to determine how complete and accurate reporting to the Pennsylvania Cancer Registry is in the tri-county area for MPNs (specifically, PV, ET, PMF, chronic myelogenous leukemia, and MPN not otherwise specified).

*Milestones:* Recruitment is ongoing; 85 participants have agreed to be in the study. Ongoing work includes collection of blood samples from participants, interviewing participants, re-contacting potential participants who have not responded, and expert panel reviews of each case.

## Genetics

### **Cytogenetic study** — *Mt. Sinai School of Medicine*

*Purpose:* The cytogenetic study is investigating if patients with PV in the cluster area are genetically prone to develop the disease.

*Milestones:* Blood samples from 39 volunteers are being analyzed in the laboratory.

### **Gene profiling study** — *Mt. Sinai School of Medicine*

*Purpose:* This study is investigating if specific genes are “up” or “down” regulated in patients with PV. Blood from PV patients in the cluster area will be compared to other PV patients who live elsewhere.

*Milestones:* The blood of 15 people has been tested: 6 people with a PV diagnosis living in the tri-county area, 5 people with a PV diagnosis living outside the tri-county area, and 4 persons without a PV diagnosis. This data is being analyzed.

### **JAK2V617F mutation-positive non-MPN person follow-up study** — *Geisinger Health Systems*

*Purpose:* This study monitors the levels of JAK2 (+) genetic mutation in participants identified with this mutation during ATSDR’s community health screening. Over one thousand community members participated in this community health screening in 2010. Participants will be evaluated twice yearly, including testing of how much JAK2 mutation is in their bodies. Participants will be evaluated for at least three years or until an MPN develops.

*Milestones:* The fifth round of this evaluation is underway. Participants will continue to be monitored for symptoms, how much JAK2 mutation they have, and the potential for disease progression. No participant has developed active disease yet. When the contract ends, Geisinger expects to follow the participants for at least 2 years. Funding from ATSDR has allowed Geisinger to develop an MPN initiative. This has made many clinical trials available for MPN patients. Samples from more than 40 volunteers were collected and sent to the MPD-RC Tissue Bank to be included in several other studies.

### **NHANES JAK2V617F prevalence study** — *Mt. Sinai School of Medicine and ATSDR*

*Purpose:* This study is to determine the number of people who have the JAK2 mutation using samples collected as part of CDC’s National Health and Nutrition Examination Survey (NHANES).

NHANES assesses the health and nutritional status of adults and children in the United States.

*Milestones:* Analysis of all NHANES samples for the JAK2V617F mutation is complete. The results are being evaluated. The study results will be submitted for publication in a scientific journal.

### **Pennsylvania JAK2V617F prevalence study** — *Geisinger Health Systems*

*Purpose:* This study will determine what percentage of a select population of people in Pennsylvania has the JAK2 mutation. The study will evaluate about 7,000 people living outside the cluster area and 1,500 people living within the cluster area.

*Milestones:* More than 6,000 samples have been analyzed for the JAK2 mutation.

### **Tissue bank** — *Myeloproliferative Disease Research Consortium*

*Purpose:* The tissue bank collects and stores tissue samples from MPN patients living in the cluster area.

*Milestones:* 97 people are participating in the MPD-RC Tissue Bank. Recruitment is ongoing.

## **Toxicology**

### **Bone marrow toxicology assay** — *Mt. Sinai School of Medicine*

*Purpose:* The toxicological assay evaluates whether 18 environmental contaminants can cause DNA damage.

*Milestones:* Laboratory experiments (in-vitro assays using stem cell-derived progenitor cells) using 18 environmental contaminants are in the process of being confirmed. Results are being analyzed.

## **Environmental Analysis**

### **Air and water exposure assessment** — *Equity Environmental Engineering*

*Purpose:* The air and water exposure assessment is examining potable water sources and potential air emissions that may have led to or are connected with the higher than normal rate of PV cases within the tri-county study area. Present and past exposures of cluster area residents are being evaluated.

*Milestones:* The sampling plan was finalized, and environmental samples are being collected. Air modeling is complete. A geographic information system (GIS) database has been created and is being updated with new information and data.

## **Environmental exposure assessment data inventory – ATSDR**

*Purpose:* This project developed a database containing federal, state, and other relevant data and documents relating to possible human exposures to contaminants from hazardous waste sites and other operations, industries, or businesses that release toxic material within the cluster area.

*Milestones:* This project is complete. Information has been compiled into a database. The data warehouse contains about 100,000 samples and 2.5 million records for 2,700 substances. This database was made available to interested research partners.

## **Environmental testing — Pennsylvania Department of Environmental Protection**

*Purpose:* The tri-county environmental testing collected more data about contaminants in the water flowing out of the McAdoo Superfund site and near three waste coal burning plants. The project also collected drinking water and soil samples from homes in the cluster area. Testing included homes of people with a PV diagnosis and people who do not have PV.

*Milestones:* Environmental samples from near the McAdoo Superfund site and three waste coal burning plants as well as from three rounds of residential sampling have been collected and analyzed. Homeowners have received results of the first two phases of residential sampling, and will receive their results from the third and final round of residential environmental testing in early fall. ATSDR is evaluating all of the environmental testing results from this project.

## **For more information**

Visit ATSDR's Web page on PV: [http://www.atsdr.cdc.gov/sites/polycythemia\\_vera/index.html](http://www.atsdr.cdc.gov/sites/polycythemia_vera/index.html)

Call ATSDR's toll-free PV information line: 1-866-448-0242 or email [ElvinBarnwell@cdc.gov](mailto:ElvinBarnwell@cdc.gov), which will connect you to Dr. Elizabeth Irvin-Barnwell, ATSDR Division of Toxicology and Human Health Sciences.

Contact Lora Siegmann Werner, ATSDR Region 3, by phone at 215-814-3141 or by email at [LWerner@cdc.gov](mailto:LWerner@cdc.gov).