Group Against Smog and Pollution, Inc.
Hotline

Spring 2016 www.gasp-pgh.org

A Change in the Air After the Closure of the Shenango Coke Plant

by Karen Grzywinski, GASP Board Member

Spring 2016 is proving to be unlike any previous spring for residents of communities surrounding Neville Island. Since the DTE Energy Shenango Coke Plant ended production in January, pollution from the battery no longer intrudes in their lives. Daily routines, as ordinary as opening windows to let in an evening breeze, are joyful events for many residents.

Gretchen Anderson and her husband, Clint Hoover, moved to Avalon five years ago from Minneapolis. They were not aware that their home was located at what they later titled "ground zero" for pollution from Shenango. Gretchen had given up sleeping with the windows open because pollution infiltrated their home. "Now I do. I had forgotten how fun it is to wake up to the birds singing! I can open the windows and air out the house. We're looking forward to using our porch and yard this year, instead of staying inside to avoid the stench." The return of these simple routines emphasizes how miserable life was for those living closest to the plant.

The Shenango coke battery operated for 54 years. At the time of the shutdown, there were 70,000 people living within a three mile radius of the plant. Despite entering into consent orders and agreements with the Allegheny County Health Department (ACHD), the Pennsylvania DEP, and the EPA, the plant regularly exceeded allowable pollution limits, and fouled communities with particulates, sulfur dioxide, and volatile organic compounds, including benzene.

A grassroots environmental group, Allegheny County Clean Air Now (ACCAN), focused on holding Shenango accountable for violations and pollution, was established in 2014. Through the Smoke Readers Program administered by GASP, ACCAN connected with Carnegie Mellon University CREATE (Community Robotics Education and Technology Empowerment) Lab, which designed a system to monitor the plant. With a camera set up in the attic of an Avalon home, the coke plant was photographed every five seconds around the clock. Using these photos to produce a continuous video, the CREATE Lab developed the Shenango Channel at http://shenangochannel.org, an interactive site that has documented plant emissions since January 2015.

During the summer of 2015, Shenango lost power at least four times, disabling all

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In this issue

Group Against Smog and Pollution, Inc. (GASP) is a nonprofit citizens group in southwestern Pennsylvania working for a healthy, sustainable environment. Founded in 1969, GASP has been a diligent watchdog, educator, litigator, and policy maker on many environmental issues, with a focus on air quality in the Pittsburgh region.

Vote for GASP Board Members

Are you a current GASP Member? You may vote for the GASP Board of Directors. This year, ballots will be emailed to all members by the end of May. If we don't have your email address or you don't receive a ballot by June 1, please contact the GASP office by phone at (412) 924-0604 or via email at info@gasp-pgh.org.

Reducing Methane and Volatile Organic Compounds Through State and Federal Action

by Jamin Bogi, GASP Policy and Outreach Coordinator

Methane is the second-most prevalent greenhouse gas in the U.S., and at least a quarter of it comes from our natural gas industry. It's more than 80 times more potent than carbon dioxide over a 20-year span. Methane emissions from this industry must be addressed if we are to combat climate change.

Public health is at risk from climate change. Our health is also endangered by the volatile organic compounds themselves in the gas, and higher levels of ozone, of which volatile organic compounds are precursors. Benzene, ethylbenzene, and n-hexane are examples of compounds emitted by the natural gas industry. These compounds cause health effects from dizziness and respiratory impairment to cancer.

Beyond the health and climate risks, these leaks are extremely wasteful. In 2014 the industry leaked $1 billion worth of natural gas—enough to heat almost every home in Pennsylvania. By stopping leaks, the industry will have more product to sell. Many fixes pay for themselves quite quickly.

In August of 2015, the Environmental Protection Agency (EPA) proposed rules to reduce methane and volatile organic compound pollution from the natural gas and oil sector, starting with new and modified sources. The ultimate goal of the EPA is to reduce methane emissions 40-45% from 2012 levels by 2025. The improved standards addressed fixing leaks, "green" completions, and limiting emissions from different types of equipment like compressor engines and pneumatic controllers. Last month, President Obama announced similar proposals to address existing sources. Information is being gathered now to identify the largest sources of emissions from existing operations.

Here in Pennsylvania, the nation's #2 natural gas producer, Governor Wolf is taking his own action. As EPA develops their standards, Pennsylvania's leadership can be the model that shapes EPA's work.

Governor Wolf's framework to reduce methane and volatile organic compounds was released in January. The plan addresses well sites, compressor stations, pipelines and more, for both new and existing operations. The plan includes "best-in-class" components already used by industry leaders or mandated in other states. Governor Wolf's 4-point plan will reduce leaks:

1) At new gas well pads by developing a new general permit for exploration/production/processing, requiring "Best Available Technology" for equipment and processes, better record keeping, and quarterly monitoring inspections.
2) At new compressor stations and processing facilities by revising its current general permit (GP-5), updating Best Available Technology requirements and requiring more stringent Leak Detection and Repair, among other requirements such as the use of cleaner running Tier 4 diesel engines.
3) At existing sources. The PA Department of Environmental Protection will develop regulations for the Environmental Quality Board to consider.
4) Along pipelines through best management practices, including Leak Detection and Repair. Currently, there is generally no methane monitoring, leak detection, or control of fugitives from transmission or distribution pipelines.

Stick with GASP to stay abreast of this issue, especially on our website or on Twitter @GASPPgh, as we expect more movement on this soon—and we'll need you to weigh in in support of strong regulations that better protect public health.

The **Hotline** is the semiannual newsletter of the Group Against Smog and Pollution.

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GASP Mission Statement

The Group Against Smog and Pollution works to improve air quality to ensure human, environmental, and economic health.

Methods of Achieving Mission

GASP is a citizens' group based in Southwestern PA which focuses on environmental issues in the surrounding region. When pertinent to these concerns, we participate in state and national environmental decisions.

We believe in the public's right to receive accurate and thorough information on these issues and to actively participate in the decision making process.

To achieve our environmental goals on behalf of our membership, GASP will advocate, educate, serve as an environmental watchdog, mobilize action, and litigate when necessary.

We will work both independently and in cooperation with like-minded individuals and groups as determined by the Board of Directors.

We will uphold GASP's reputation for scientific integrity, honesty, and responsible involvement.

Why Are Diesel Cars Exempt from Emissions Testing in Pennsylvania?

by John Baillie, GASP Staff Attorney

Have you ever thought of buying a diesel car or light-duty truck in Pennsylvania? If you have, you may know that diesel vehicles are exempt from Pennsylvania's vehicle emissions testing program. We were puzzled by this and decided to look into it.

But first, some background regarding vehicle emissions.

Motor vehicles are one of the principal sources of emissions of oxides of nitrogen (NOx) into the atmosphere. This is significant because in the atmosphere, NOx (and other pollutants) combine and react in the presence of sunlight to form ground-level ozone, also known as smog. At certain concentrations, ozone can irritate the eyes and upper respiratory system, hamper breathing, and damage crops, buildings, and other man-made materials.

A small diesel vehicle can be a disproportionately large source of NOx emissions – according to an article published by the English newspaper The Guardian on October 21, 2015, a single diesel car without properly-functioning emissions controls can emit more NOx than a heavy-duty truck. In Europe, where diesel cars make up a much larger percentage of the vehicle fleet than they do in North America, cities have struggled in recent years with unhealthy smog levels that have been blamed on vehicle emissions. Diesel vehicles are also a source of fine particulate matter (PM2.5) pollution, which contributes to the smog problem in some cities.

The Clean Air Act requires EPA to prescribe National Ambient Air Quality Standards (NAAQS), which are the ambient air concentrations for certain "criteria" pollutants that must be attained to protect the public health and welfare, and to designate areas that do not attain one or more NAAQS. Because of ozone's harmful impacts on human health and the environment, it is regulated as a criteria pollutant under the Clean Air Act; so is PM2.5. As of October 1, 2015, a number of counties in Pennsylvania (as well as counties in the downwind states of New Jersey, New York, and Connecticut) did not attain the NAAQS for ozone that EPA issued in 2008; other counties did not attain the NAAQS for PM2.5 that EPA issued in 2012. Many more counties in Pennsylvania and its neighboring states currently measure ozone levels above the NAAQS for ozone that EPA approved in 2015, and will presumably be designated as nonattainment areas when such designations are made later in 2016 or in 2017.

The Clean Air Act Amendments of 1990 include provisions that are intended as a response to the vehicle emission and ozone pollution problems that exist in certain parts of the United States. Specifically, one provision of those amendments, 42 U.S.C. § 7511c(a), creates an "ozone transport region" (which includes Pennsylvania and the other northeastern states), and another, 42 U.S.C. § 7511c(b), requires each state in an ozone transport region to implement an "enhanced vehicle inspection and maintenance [(I/M)] program" in each metropolitan statistical area (MSA) having a population of at least 100,000.

The Clean Air Act Amendments of 1990 also require that enhanced vehicle I/M programs reduce NOx emissions from motor vehicles registered in "urbanized" MSAs in the ozone transport region and other areas of the country that do not attain one or more of the NAAQS for ozone. Enhanced vehicle I/M programs help reduce vehicle emissions and contribute to reductions in levels of ozone and other harmful pollutants by identifying vehicles that have emission control systems that are in need of repair and requiring such repairs as a condition of vehicle registration. EPA was required to publish guidance for the state enhanced vehicle I/M programs that are required by the Act, and such state programs must comply "in all respects" with EPA's guidance. Further, EPA's guidance was required to include "a performance standard achievable by a program combining emission testing, including on-road emission testing, with inspection to detect tampering with emission control devices and misfueling for *all* light-duty vehicles and *all* light-duty trucks [emphasis added] subject to standards under [42 U.S.C. § 7521]." All gasoline- and diesel-powered light-duty vehicles and light-duty trucks, beginning with model year 1994, are subject to standards under 42 U.S.C. § 7521.

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Diesel Vehicles
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Now, the specifics regarding Pennsylvania's diesel exemption.

EPA published its guidance for state I/M programs in the Federal Register on November 5, 1992. That guidance "assumes coverage of *all* 1968 and later model year light duty vehicles and light duty trucks up to 8,500 pounds [gross vehicle weight rating], and includes vehicles operating on *all* fuel types [emphasis added]." The guidance does not purport to exempt diesel vehicles from the enhanced vehicle I/M program requirement.

Pennsylvania first submitted a proposal to implement an enhanced vehicle I/M program to EPA on November 5, 1993. Although EPA's guidance purports to permit "special exemptions" from an enhanced vehicle I/M program if certain conditions are met, Pennsylvania has never claimed a special exemption for diesel-powered vehicles. In 1996, EPA recognized that Pennsylvania's submission did not "include vehicles operating on all fuel types," as EPA's guidance and the Clean Air Act both expressly require, but nevertheless proposed to approve the submission, on these bases:

- Pennsylvania had committed "to adding the required testing [of vehicles operating on all fuel types] once EPA promulgates regulations on alternative fueled vehicle I/M testing;"
- Pennsylvania had existing legal authority to add such testing; and
- the program's "level of coverage … provides the necessary emissions reductions to meet the I/M Performance Standard."

Pennsylvania's enhanced vehicle I/M program received EPA's final approval on or about June 17, 1999.

We think that EPA's approval of Pennsylvania's enhanced vehicle I/M program violates EPA's guidance and the Clean Air Act. **First**, EPA's guidance requires that enhanced vehicle I/M programs "include vehicles operating on all fuel types," as does the Clean Air Act. The guidance does not authorize exemptions for classes of vehicles based on EPA's failure to promulgate regulations specifying a method for testing such vehicles' emissions. Even if it did, the factual basis that EPA claimed with respect to diesel vehicles in Pennsylvania's case no longer exists – in 1996, EPA promulgated regulations that require "all model year 1996 and later light-duty vehicles and light-duty trucks equipped with on-board diagnostic systems" to undergo checks of those systems in areas subject to the enhanced vehicle I/M program requirement. Diesel light-duty vehicles and trucks built for sale in the United States have been equipped with on-board diagnostic systems since model year 1997. Accordingly, other states' enhanced vehicle I/M programs (including those in Ohio, New Jersey, and New York) require model year 1997 and newer diesel vehicles to undergo on-board diagnostic checks in accordance with EPA's 1996 regulations. The fact that those state programs have been approved by EPA underscores the conclusion that a valid, federally-approved method for conducting emission tests of model year 1997 and later diesel vehicles exists.

Second, EPA's guidance does not permit diesel-powered light duty vehicles (LDVs) and light duty trucks (LDTs) to be exempted from a state's enhanced vehicle I/M program based on the state's ability to meet emissions reductions targets by other means. Rather, the guidance mandates that "all" vehicles subject to standards under 42 U.S.C. § 7521 are also subject to enhanced vehicle I/M programs where such programs are required.

Third, the fact that Pennsylvania has the legal authority to include diesel-powered LDVs and LDTs in its enhanced vehicle I/M program does not excuse it from its duty exercise such authority, especially where it is necessary to comply with EPA's guidance.

In 2012, EPA promulgated a new NAAQS for PM2.5, and subsequently determined that a number of counties in Pennsylvania (including Allegheny County) did not attain that NAAQS. Pennsylvania will be required to submit a State Implementation Plan to EPA in October 2016 to show how it will attain the 2012 PM2.5 standard, and will be required to make the SIP available for public comment before it is submitted to EPA. If you agree with us that Pennsylvania should comply with the Clean Air Act and hold diesel vehicles to the same emission testing standard as gasoline-powered vehicles, you can submit comments to the agency that publishes the SIP (most likely either the Allegheny County Health Department or the Pennsylvania Department of Environmental Protection) that ask the plan to do so. Future GASPAlerts will let you know when and where to submit your comments. (Sign up for GASPAlerts on the GASP website at www.gasp-pgh.org)

Shenango
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Shenango Coke Plant, June 11, 2015 at 6 PM

Same view on April 24, 2016 at 8 AM

Photos are both from the Shenango Channel

pollution controls, and creating particularly egregious pollution episodes in the area. EPA and ACHD began discussions to reopen their 2012 Consent Agreement with the plant. On November 19, 2015, video from the Shenango Channel was presented at a community meeting organized by ACCAN, and attended by ACHD and EPA representatives. In his comments, EPA Region 3 Deputy Director David Arnold stated that what he saw in the video was "totally unacceptable."

Following the meeting, DTE Energy defended its operation of Shenango and renewed its commitment to bring the plant into compliance. Less than a month later, DTE Energy announced plans to shut down the Shenango coke battery, blaming a downturn in the U.S. steel industry and a reduced demand for coke. The unfortunate consequence of the sudden closure was the loss of jobs for 173 employees.

Since Shenango shut down, the improvement in air quality can be confirmed. Air quality complaints registered with ACHD are down significantly compared to last year. For the first quarter of 2015, ACHD received 109 complaints from the 15202 area, which includes Avalon, Bellevue, and Ben Avon, the communities downwind of the Shenango plant. Individuals filing those complaints identified Shenango as the source of pollution in 99 of the 109 reports. During the first quarter of 2016, ACHD received only 13 complaints from the 15202 area, an 88% reduction.

Another measure of improvement can be seen on the Shenango Channel, which now records a haze-free site. There are no more grey, black, and tan emissions billowing from the plant.

One of the ways Dawn Winters knows that the air quality has improved at her Bellevue home is through the lower readings of the Speck particle monitors on her front porch. The monitors, also developed by the CREATE Lab, have shown a trend downward in particulate counts since Shenango closed. But statistics and monitors have never accurately described the effects of chronic pollution residents suffered due to the Shenango operation. Since moving to Bellevue in 2014, Dawn said "Shenango's pollution had a noticeable impact on my quality of life and my overall opinion of Pittsburgh." As a parent of a newborn, "I worried constantly for my family's health." Now, there is a "noticeable improvement" in the air quality. Before the plant closed, Dawn had been hoping to move to a less polluted area. Now, she has no immediate desire to leave Bellevue.

Debbie Blackburn and her family have lived in Ben Avon, across the river from the Shenango battery, for more than 19 years. They had made plans to move this spring because they could no longer cope with the constant pollution. When the family learned of the plant closure, they decided to stay and are enjoying a "Shenango-free spring." Debbie says that the air is refreshing and "the wind… feels clean against your skin, not gritty and heavy. Sounds crazy, but it's true!" Her son, Elliot, believes that the difference is "unquestionable, and everyone is happier, including the animals and plants."

The last batch of coke was pushed in the early evening of January 6, ahead of the shutdown schedule DTE had announced. The ovens were turned off and, as they lost heat, immediately began to deteriorate. They cannot be used again. ACHD has confirmed that, with current regulations, another coke battery would not be permitted in such a populated area. Late in the evening, after the shutdown, Leah Andrascik and her family were driving back to their Avalon home from a trip out of town. They live around the corner from the ACHD Avalon monitoring station, downwind of the Shenango battery. Leah recalls that "as soon as we turned onto Ohio River Boulevard, I knew something was different. I told my husband that the coke ovens must be off already."

ACHD plans to continue air monitoring in the community for a year after the Shenango closure. Additionally, a group made up of health professionals, academics, and environmental organizations, including GASP, was formed to assess health standards in the communities, before and after the Shenango shutdown. The closure of the site is being managed by DEP for water, storage tanks, and waste matters, and ACHD for air quality issues.

The morning after that last coke oven was pushed, Leah received an email confirming the Shenango shutdown. "It was like a huge weight had been lifted. We can leave windows open overnight without waking to nauseating odors or headaches. Our boys play outside and I don't have to cut their play time short because of odors in the neighborhood. We're optimistic that we'll be able to stay in the home and community we now can love."

Local Effort to Learn About Indoor Air Pollution in Homes

by Don Fugler, Researcher, Reducing Outdoor Contaminants in Indoor Spaces

ROCIS, Reducing Outdoor Contaminants in Indoor Spaces, is a Southwestern Pennsylvania initiative funded by the Heinz Endowments. The aim is to determine how best to protect houses and other buildings from outdoor air pollutants, in collaboration with other groups promoting healthy environments. We pronounce ROCIS as "raucous," or "making a loud noise," partly because this is ground-breaking research and partly because technical researchers need to say something uplifting and goofy after plowing through reams of data.

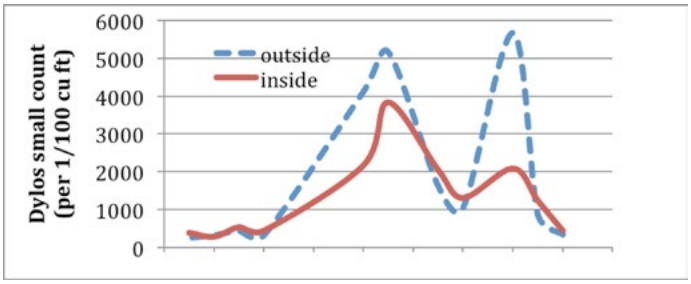
The Low Cost Monitoring Project is part of the ROCIS initiative. It uses relatively inexpensive monitors to allow householders to understand and improve their indoor air quality. So far we have tested over 40 homes for pollutants such as carbon monoxide (CO), carbon dioxide (CO_2), radon, and small particles (such as PM2.5). What are we finding in this mix of Pittsburgh houses?

1) Lots of them have radon. Oops! That is not something anyone wants to hear, but it is a good thing to know, one way or the other.
2) We have not seen much CO in houses either from outside (e.g. attached garages) or inside (gas ranges).
3) Houses can have very low to very high small particle counts, from a variety of sources.

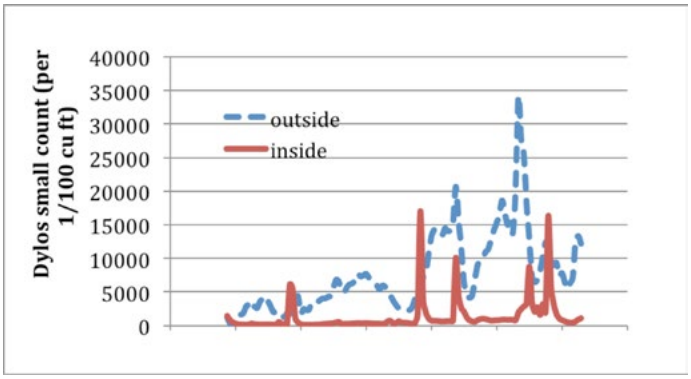
Let's concentrate on particles. Respirable particles, such as PM2.5, are very small, airborne particles that can penetrate deep into the lungs and cause or contribute to a variety of illnesses. The wisest course of action is to keep indoor particle levels low for good health. Can you measure what the particle level in your home is? Does it change much? Are there some activities that cause high particles? Do many particles from outside enter into the home? The answers we have learned are "Yes," "Yes," "Yes," and "Maybe."

Measurement technology has greatly advanced in the last several years. Particle measurement devices used to cost thousands of dollars. Now you can purchase particle counters for your house in the $200-$300 range. This is a big step. These devices count particles whereas the health standard, PM2.5, measures the weight of captured particles. This means that the new, low-cost particle counters such as the Dylos and Speck monitors that we have been using cannot compare your house conditions directly to health standards. They can, however, tell you if your particle levels are low or high, better or worse than yesterday (for instance), or affected by activities in the home. All this information is good for a homeowner to judge and control particle levels in their home.

Do outdoor particles enter houses in great numbers? Here is a graph of a house with open windows in the fall. In this case, indoor air is very much like outdoor air, and you can see how the particle counts in the house rise and fall over several days following changes to the outdoor concentrations.



However, in winter, outdoor particles have an effect on indoor counts but these effects are much lower than in the summer with open windows. Some of the red spikey bits in the graph below correspond with cooking activity.



When indoor sources are minimal, such as when residents are on vacation or asleep, the effect of outdoor particles on indoor particle levels is seen more clearly. The Dylos monitor has its own "Air Quality" scale for the particle counts observed. High outdoor particle counts make it hard for the indoor levels to attain the "Good" to "Excellent" ratings. Based on preliminary analysis of the Dylos particle readings, over 75% of the homes involved to date have a median indoor value in the "Fair" to "Poor" range. Most of the testing has been done with homes with windows closed.

However, the evidence to date in the ROCIS research shows that an average closed house in Pittsburgh provides a better defense against outdoor particles than we expected.

Initial calculations show that the median levels of particles in the "cleanest" house are about 1/20 of the particle counts in the house with the highest particle counts. That is a big

range. You want your house to be on the low side of that range.

Other particle findings have shown a variety of indoor particle sources. Cooking, especially frying, can really drive indoor particle counts through the roof. ROCIS has been playing with ways to reduce these effects (induction ranges, good range hoods, lower frying temperatures). We are still learning. We can see the advantages of either good filtration on a constantly running furnace circulation system or the use of efficient portable particle filters. Again, we are trying to sort out the best ways to reduce high particle counts based on what we find in these Southwestern Pennsylvania homes.

Stay tuned to this raucous initiative. You can find our monthly Compendium of Resources, as well as updates and presentations at www.ROCIS.org. If you want to be a part of it, we are recruiting homeowners (or renters) to participate for a 3-week cohort. During the warmer months, we can investigate the effects of open windows, air conditioners, and air cleaning, among other issues. If you are interested in being part of this, and learning more about your house, contact Linda Wigington at lwigington1@outlook.com.

These Low Cost Monitoring Project participants have used the fan/filter as a portable air cleaning device in their home. From left to right, Dominick Pandolfo, Andrew Ellsworth, Zaheen Hussain, Greg Wozniak, Maren Cooke. Photo: Raven Rocks Press.

We expect to publish both locally and widely when we have definitive conclusions. We are learning how to protect home residents from particles and other pollutants. This could be important to you or the people you serve.

Air Pollution and Health: Now it's the Brain Too!

by David Eibling, MD, GASP Board Member

Anyone reading the GASP Hotline is already well aware of the known effect that air pollution has on lung function and cardiovascular status. The data linking small particulate [fine and ultrafine (PM2.5)] to cardiovascular health, based on high quality observational as well as laboratory studies is not controversial. Multiple other effects of poor air quality, long suspected, such as chronic sinusitis, are now being identified.

Perhaps the most frightening effects to appear in the scientific literature are the recent studies (most within the past seven to eight years) linking air pollution to cognitive decline. In May 2016 this topic was addressed at the GASP event, Making the Connection: Air Pollution and Brain Health, featuring Michelle Block and Jane Clougherty.

Cognitive decline, dementia, and particularly its most advanced form, Alzheimer's Disease, has a marked impact on individuals, their families, and society. All of us know individuals with the disease, and are well aware of the effects on them, their close family members and friends, and their communities. It is an awful, progressively disabling disease with far-reaching impact, and possibly, the most feared chronic disease attending end-of-life.

It is clear that this degenerative brain disease is multifactorial, and considerable ongoing research seeks to tease out the factors contributing to its development and progression. Even more important is the quest to identify possible solutions that hopefully could block its development, or at least delay its onset and slow its progression. Even if prevention or cure is not achievable, delaying the onset would convey major benefit by assisting with what the geriatricians term "compression of morbidity," which means to compress severe disability into the shortest possible time prior to death. Achieving this goal would provide benefit not only for the individual and their family, but society as a whole as well. A two-year delay in onset over a 40-year span would reduce the number of cases of Alzheimers by approximately 2 million, and the resultant benefits of extended useful life and reductions in expenses required for long term care would be enormous.

Unfortunately, painfully little is known about the development of this disease, other than the structural changes of brain tissue that accompany the decline. It is believed that these changes stem from chronic, long-term inflammation, with variability among individuals related to the extent and

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type of individual-specific response to inflammation. As of 2016, minimal knowledge exists on how to modify this inflammation and the adverse effects it has on brain tissue.

Recent research has demonstrated an association between air quality and cognitive decline. Population studies have shown that Alzheimers disease is more prevalent among older individuals living in highly polluted areas. Post-mortem studies of dogs living in highly polluted cities like Mexico City, as well as experimental rats raised in air samples from such cities as Los Angeles have demonstrated clear evidence of brain changes. These and other studies demonstrate the presence of neuroinflammation and interruption of the blood-brain barrier in animals exposed to high levels of ambient pollution. Autopsy studies add further to the hypothesis that high levels of air pollution results in increased inflammatory markers as well as other histologic changes which have been identified in the brains of children living in highly polluted cities. (Calderón-Garcidueñas et al)

A report by Jennifer Weuve and coauthors, published in the Archives of Internal Medicine in 2012, was the first longitudinal study of cognitive decline in older adults that validated this previously suspected risk. The authors, from several renown and reputable universities, selected their study cohort from the Nurse's Health Study, a large prospective study of 121,700 nurses who enrolled in 1976, with an amazing long term follow-up of 90% over the 4 decades since trial initiation.

From this study the investigators invited 22,700 nurses aged 70 or above to participate in cognitive testing, with 19,409 nurses aged 70-81 eligible for study. The investigators utilized GIS data linking known average monthly PM2.5 and PM2.5-10 monitor data to determine exposure to fine particulate air pollution for the individuals in their cohort. The dates of the study were selected, in part, due to the availability of nationwide PM data. PM10 data was available after 1988, but PM2.5 data was not available until 1999, requiring stratification of the study to accommodate the specific enrollment period of the subjects.

Baseline tests of cognition were performed at enrollment, and follow-up cognitive testing was performed approximately 1.9 years and 4.3 years after baseline testing. Amazingly the investigators reported follow-up participation was greater than 83%. When I asked about this figure, one of the nurses with whom I work who is enrolled in the Nurses Health Study, pointed out the rigor with which the investigators seek follow-up – even resorting to phone calls if letters and emails go unanswered.

Largely a result of this rigor, this was not only the first truly longitudinal study of cognitive testing in a group of older women, but also likely to be highly reliable. The phone-based cognitive test utilized is a well known and validated tool.

The reader can already assume by our prose that the results were positive. And in fact, the investigators demonstrated with high reliability that exposure to high levels of particulate air pollution increased the risk of cognitive decline. Mathematical models suggest that for 10 ugm/m3 difference in cohort exposure to fine and ultra-fine particulate is associated with up to 2 years difference in aging.

As always, efforts to prove that the association is due to cause-and-effect is challenging. Prior studies have linked cognitive function of individuals to ambient air pollution. This study, however, is the first to study a large cohort in a prospective manner, adding credence to the hypothesis that the findings of cognitive testing are more than merely association – and that the findings are due to the air pollution. Due to the large numbers, it is unlikely (but still possible) some other unrecognized factor (such as traffic noise) may account for the association. For the present, the Weuve study is the best evidence available. For reasons we will outline below, the hypothesis that the observed cognitive changes relate to fine and ultrafine particulate air pollution is highly plausible.

Exposure to fine particulate air pollution has been shown by both observational and experimental means to have dramatic effects on cardiovascular function. There is general agreement that these effects are mediated by inflammation. Moreover, studies in several animal models confirm the presence of inflammation and interruption of the blood-brain barrier in animals exposed to high levels of ambient pollution. Adding further to this hypothesis is the finding of increased inflammatory markers in the brains of patients who lived in highly polluted cities prior to death, as well as changes in the blood-brain barrier, which functions to protect the brain from circulating toxins.

It seems likely that even beyond the direct effects on brain tissue, the well-recognized cardiovascular effects of fine and ultrafine particulate air pollution may secondarily affect brain structure, and function, through their impact on cerebral vasculature.

So what are our take-home points? The first is that cognitive decline and dementia impart a terrible burden on families and society. The second is that, as of 2016, there is relatively little that has been proven to prevent, or even delay the onset of this decline. Thirdly, fine and ultrafine particulate air pollution has now been convincingly demonstrated to impact the onset of measurable decline. Fourthly, we now recognize that a modifiable risk factor (particulate air pollution) for dementia exists that we can, if the collective will exists, impact.

Even if we succeed in delaying the onset of clinical

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GASP in Action: Ozone Gardens

by Jessica Tedrow, GASP Education and Events Coordinator

This spring, GASP had the opportunity to work with several middle school students at Winchester Thurston for their Leadership Academy. The Leadership Academy focuses on specific subjects like air quality, and schools partner with local organizations to provide expertise. Students spend time on and off campus, work on a project that is related to their topic throughout the year, and share their accomplishments and what they have learned with the rest of the school community.

The students' final project included an "ozone garden" on the playground at the school campus. Ozone gardens demonstrate the impacts of air pollution on plant and human health by seeding ozone sensitive species. They were able to split their garden into three planters, and they designed their own informational signs to go inside. These students did a fantastic job with their garden!

GASP will complete other ozone garden planters in the coming months at Woodland Hills High School with their Prime Time after school program.

Do you have a community or school garden you'd like to turn into an ozone garden? Please contact GASP Education and Events Coordinator, Jessica Tedrow, at jessica@gasp-pgh.org.

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dementia by a year or two through reductions in exposure to particulate air pollution, the effect on the quality of life for older adults, their families and caregivers, and society as a whole would be enormous.

Finally, it is clear from the Calderon-Garciduenas study that these effects begin in childhood, suggesting that perhaps an even greater benefit than delaying the onset of Alzheimer's would be enhancement of cognitive function of the millions (billions?) of children currently living in the megacities of the world with unacceptable levels of particulate air pollution.

Sources:
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The Legacy of Lead in Flint and Beyond

by Sue Seppi, GASP Project Manager

The lead contamination found in the drinking water of many Flint, Michigan homes has not only created a health emergency in that community, but reminded us on a national level that vigilance is still needed when it concerns lead. There is no known safe health level of lead exposure.

Lead can affect almost every organ in your body, and children under six years old are the most at risk. Even low levels of lead in the blood of children can result in lower IQ, behavior problems, hearing problems, anemia, and slowed growth. There is no universal requirement in Pennsylvania for lead testing in children, but most insurance and Medicaid will provide coverage.

In 2012, the Centers for Disease Control and Prevention (CDC) changed the "actionable" reference blood level from 10 µg/dL to 5 µg/dL. This changing reference level is based on the highest 2.5 percentile of lead levels found in children aged 1-5 in national testing. The CDC recommends chelation therapy treatment if blood test levels reach 45 µg/dL. The 5 µg/dL reference level indicates case management is needed to prevent further lead exposure.

In adults, high lead blood levels can increase blood pressure, decrease kidney function, and cause reproductive problems.

Because lead has so many valuable properties such as high density, low corrosivity, and high malleability, it or its compounds have been used extensively in manmade products since antiquity. Relatively recent uses of lead include additives to paint and gasoline, pipes, solder, and lead acid batteries. Adverse health effects, now well understood, brought about protective regulations in the late 1900s.

- In 1978, the use of lead-based paint in housing was banned by the U.S. Consumer Product Safety Commission.
- In 1986, the Safe Drinking Water Act Amendments required that only lead-free piping be sold. "Lead-free" was defined as containing no more than 8% lead in pipes and .2% in solder.
- In 1990, the Clean Air Act ended the pervasive use of a lead compound used as an antiknock agent in gasoline.
- In 1991, the Lead and Copper Rule established by the Environmental Protection Agency required water systems to control corrosion in customers' plumbing, monitor water at customers' taps, rule out source water as a significant source of lead levels, and if lead levels were exceeded, provide public education on lead reduction activities.
- In 2008, the National Ambient Air Quality Standard for lead was reduced to .15µg/m3 on a rolling 3-month average.
- In 2011, the Reduction of Lead in Drinking Water Act brought down the allowable lead content in wetted pipes, fittings and fixtures to .25%. The law went into effect in 2014.

With the comparatively recent regulatory controls on lead, it is not surprising that much of the lead exposure arises from a legacy of older homes/buildings that still contain leaded materials. Almost 31% of homes in Allegheny County were built before 1939, and the medium age of a home in the county is 58 years,[1] making most of the houses constructed before the 1978 ban on lead in paint. Dr. Karen Hacker, Allegheny County Health Department Director, noted that "... lead paint in homes poses the greatest [lead exposure] risk to children in Allegheny County."[2] Friction areas such as windows, doors, and railings easily shed paint dust or chips with use. Children can get it on their hands and from there into their mouths.

What about lead in water in Allegheny County? This county is not so different from Flint or other cities with older housing incorporating lead service lines (pipes from the road to the house) and lead solder in the home. Flint switched water supply to the Flint River. The river did not contain problematic lead levels but it did have other problems including a high corrosive property. Usually water treatment plants would test and treat their water supply appropriately to reduce corrosive activity, but this wrongfully was not done in Flint. Why this did not happen is an ongoing debate. The inaction resulted in lead leaching into tap drinking water from the older lead pipes and solder. The exposure led to higher blood lead levels in children, large scale use of bottled water, firings, and lawsuits that are still ongoing.

Unfortunately, Flint might be the canary in the coalmine or wading in the river in this case. A *USA TODAY* investigation has identified almost 2,000 water systems spanning all 50 states where end of pipe (tap) testing has shown excessive levels of lead contamination over the past four years.[3] A *CBS Pittsburgh* news headline recently read, "Report: 18 Cities in Pennsylvania, including Pittsburgh, Have Higher Lead Exposure Than Flint."[4] Note that this later headline is not necessarily directed at a water problem.

The lead action level for water is 15 parts per billion (ppb). In Pittsburgh, the Pittsburgh Water and Sewer Authority (PWSA) collects 50 samples in homes with lead exposure and is required to do so every three years. The testing result in 2013 was 14.7ppb for the top 10 percent of tests, just three tenths shy of the the 15ppb threshold. The PWSA, unlike Flint, had used corrosion control, but in

April 2014 it switched its corrosion treatment from soda ash to caustic soda. In January 2016, PWSA went back to using soda ash. If this seems routine, the Pennsylvania Department of Environmental Protection (DEP) did not think so.

On April 25, 2016, DEP issued an administrative order citing the PWSA for making the soda ash to caustic soda change improperly, without getting prior approval from the DEP. Both types of corrosion control are approved for some water systems but PWSA did not prove to the DEP that the caustic soda would be effective in this water system. The DEP said, "Caustic soda (sodium hydroxide) raises the pH of water to bind up metals, but does not have carbonate to coat water lines, and relies on the natural carbonates in the authority's source water from the Allegheny River."[5] Were there enough carbonates in the Allegheny River water and at all times of the year? So far the answer seems to be unclear.

PWSA will be required by DEP to complete two rounds of testing at the tap for lead and copper from 100 lead containing homes, develop a plan to investigate the effect of corrosion control changes, and provide initial notice to all 300,000 customers about the prior change in corrosion control chemicals and the measures being undertaken to evaluate impacts.

A recent TribLIVE article noted that DEP officials said PWSA made the change in chemicals because of an increase in soda ash cost and because equipment used to feed it into the system was not operating properly.[6] DEP Secretary Quigley noted in a press release, "We do not tolerate deviation from water quality regulations that might, in any way, potentially compromise the public's health and safety."[7]

Unfortunately, lead is still in the community and caution is constantly required.

- ✓ The best way to know the lead concentration of your tap water is to get it tested. Testing kits are provided free from PWSA for their customers. Call 412-782-7554 or go to http://pgh2o.com/
- ✓ The PA Department of Health provides a toll-free Lead Information Line (1-800-440-LEAD)
- ✓ Allegheny County Health Department's Healthy Homes and Lead Poisoning Program can be reached at (412) 350-4048 or http://www.achd.net/lead/index.html
- ✓ Run your tap water until it is coldest to eliminate the standing water in pipes.
- ✓ Unscrew the tap screen and rinse the screen frequently to eliminate debris; some could be minute lead chips.
- ✓ Wet-wipe floors and window sills to pick up any possible lead dust from soil or older household paint. Remove shoes when coming indoors.

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