



Group Against Smog and Pollution, Inc. Hotline



Fall 2007

www.gasp-pgh.org

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It isn't just getting into your lungs The link between fine particulates and cardiovascular disease

by Peri Unligil, M.D. and David Eibling, M.D., GASP Board Members

The connection between air pollution and lung disease has been appreciated by the public for many years, facilitated no doubt by the images of lungs scarred by cigarette smoke and coal dust. However, the public and most physicians have only recently become more aware of the link between fine particulate air pollution and heart disease. This new awareness is undoubtedly due to the publication of an article strongly linking the two in the February 2007 issue of the *New England Journal of Medicine*, the most widely read and cited American medical journal. Publication of this article, "Long-Term Exposure to Air Pollution and Incidence of Cardiovascular Events in Women," by Miller et al,¹ triggered significant publicity as well as greater reflection on the topic by

both the public and the medical profession. The authors examined the relationship between exposures to fine particulate mass in the <2.5 micrometer range, or PM 2.5, with cardiac risk in postmenopausal women without known coronary artery disease. Annual mean PM 2.5 exposures by zip code ranged from 3.4 ug/m³ to 28.3ug/m³, with a mean of 13.5ug/m³. They found that for every 10 ug/m³ rise in PM 2.5 in readings at air quality monitors in their zip code, the risk for suffering any type of cardiovascular event rose by 24%, and risk of death from cardiovascular disease rose by 76%. This increase in risk was present after controlling for other known cardiac risk factors and socioeconomic status. This study raised

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Small Particles, Nanotechnology and Safety

by Sue Seppi, GASP Project Manager

It is no news to *Hotline* readers that many airborne fine particles (particles smaller than 2.5 micrometers (microns) or 2500 nanometers (nm) are unhealthy and associated with heart and respiratory problems. A nanometer is one billionth of a meter—about one hundred thousand times smaller than the diameter of a human hair. Examples of common nanoscale particles <100 nm in the air are found in smoke and sea salt spray.

From a health standpoint, small particle size makes it more likely the particles will work deeper into the respiratory system. Small size and other particle characteristics

may also allow these very small particles to be transported beyond the respiratory system and into other parts of the body (see above article). The federal 24-hour fine particulate standard was recently tightened significantly. The particles that are in the smallest range of the "fine particulates" are called "ultrafine particles" being <100 nm in diameter. The greatest number of airborne particles is in this ultrafine range.

The size of airborne particles can be important. For some time there has been

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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.

GASP Goes Grassroots

by Fran Harkins, GASP Community Outreach

Grassroots outreach to individuals and local community groups is a long-established hallmark of GASP. Since springtime, Fran Harkins, Sue Seppi and Lee Szymkiewicz have been working to acquaint citizens with our organization's efforts to improve the quality of air in southwestern PA, including lowering diesel fine particulate pollution, retrofitting school buses, opposing the mountaintop mining of Hays Woods, and engaging McKeesport citizens in a dialogue with CSX to decrease train idling.

Recently, GASP has done educational outreach at community day festivals in Brentwood, Bridgeville, Clairton, Crafton, Dormont, East Liberty, Hazelwood, Homestead, McKeesport, Monroeville, Mt. Lebanon, Mt. Oliver, Munhall, Murrysville and the North Side. As of this writing, upcoming events in Greentree, Leetsdale, McCandless, Millvale, Oakland, Sewickley, Squirrel Hill, South Park, the South Side, and Swissvale are scheduled.

Greenfests provided avenues of special outreach for GASP this summer. Green fairs included Drive Cleaner Drive Greener, the Pittsburgh Garden Swap, the Carnegie Science Center Greenfest, the Rachel Carson Homestead Birthday Celebration, Wilksburg Clean & Green, the East Liberty Presbyterian Church Green Fair, the Three Rivers Community Foundation event at the East End Food Coop, and the Pennsylvania Natural Living Association's Annual Conference.

On the collegiate level, GASP partnered at healthfests organized by Point Park University, the Art Institute of Pittsburgh and the Pittsburgh Technical Institute. At Pitt, we are working with Physicians for Social Responsibility as a community sponsor of their upcoming October event. On the secondary education level, GASP joined with staff of the



Fran Harkins doing community outreach for GASP

Mt. Washington Community Development Corporation to teach high school students about local air quality issues and to assist with trail cleanup in Mt. Washington Park. Hopefully, such community outreach efforts will engage individuals in taking ownership of environmental issues.

If you see GASP represented at a local event, please stop and say hello! 

The **Hotline** is the quarterly newsletter of the Group Against Smog and Pollution, Inc.

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GASP Mission Statement

GASP will act to obtain for the residents of southwestern Pennsylvania clean air, water, and land in order to create the healthy, sustainable environment and quality of life to which we are entitled.

Methods of Achieving Mission

GASP is a citizens group based in Southwestern PA which focuses on Allegheny County environmental issues. 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.

Diesel Campaign Update

by Rachel Filippini, GASP Executive Director

Safeguarding Children's Health

The Allegheny County Partnership to Reduce Diesel Pollution, led by GASP and Clean Water Action, helped launch the Pittsburgh Healthy School Bus Retrofit Fund this summer. This innovative new program will address student exposure to dangerous diesel pollution in school buses serving the Pittsburgh Public Schools. The Heinz Endowments generously provided the initial \$500,000 seed money for the fund. Fund monies will be used to retrofit school buses with filtering devices that will reduce fine particulate matter emissions by 85% or better. All school bus companies serving Pittsburgh Public Schools are eligible, and we strongly encourage them to participate.

The Healthy School Bus Fund is a joint project of the Pittsburgh Public Schools, the Heinz Endowments, Group Against Smog and Pollution, Clean Water Action, and the Clean Air Task Force. This collaboration aims to reduce childhood exposure to diesel particulate emissions which can have wide-ranging health impacts, including reduced lung function, asthma attacks, heart attacks, strokes, cancer and even premature

death. While school bus transport remains the safest way for kids to get to and from school, recent studies have shown that dangerous particulate matter from diesel engines accumulates inside the school bus cabin and reaches levels that are five to ten times more potent than in the outdoor air. This is an especially critical issue for children because their immature

lungs are 2.5 times more susceptible to diesel pollution damage than adult lungs. Retrofits available today in the form of diesel particulate filters and closed crankcase systems can virtually eliminate that problem.

If you'd like to learn more about the Pittsburgh Healthy School Bus Retrofit Fund or if you'd like GASP to come and speak to the Parent Teacher Organization at your child or grandchild's school, please let us know by calling 412-325-7382 or emailing gasp@gasp-pgh.org.

City of Pittsburgh Waste Hauler Retrofit Pilot Project

In addition to retrofitting school buses, the Allegheny County Partnership to Reduce Diesel Pollution assisted the City of Pittsburgh in obtaining an Environmental Protection Agency grant of more than \$125,000. This grant will allow the city to retrofit between eight and twelve of their waste haulers with diesel particulate filters (DPFs) and purchase a DPF cleaning station. The pilot group of approximately ten vehicles will account for roughly 15 percent of the city's fleet of 68 waste hauling vehicles.

Retrofitting even a small number of waste haulers in Pittsburgh will benefit the health of truck operators and loaders, people who live and work along municipal garbage routes, and residents in the greater Pittsburgh area. Retrofitting waste haulers with DPFs, rather than cheaper but less effective diesel oxidation catalysts (DOCs), is expected to achieve relatively large emission reductions. Targeting vehicles that will likely have long operational lives will ensure the greatest pollution reduction for the dollars spent.

The City of Pittsburgh is beginning now to identify a pilot group of vehicles suitable for retrofitting. Successful completion of the pilot project will help the Diesel Partnership gain the knowledge and experience needed to implement diesel emission reduction projects with other partners in the greater Pittsburgh area. 



PHOTO: MARLA FERRENCY

A Breath of Fresh Air

The Growing Scourge of Mercury Pollution

by John Jones

The GASP Hotline welcomes articles from guest authors in our column, "A Breath of Fresh Air." This column features GASP members and friends sharing stories from their personal or professional environmental work, as well as their thoughts on topical environmental issues. To submit a piece, please contact the editors at hotline@gasp-pgh.org. Note: The opinions of the author do not necessarily reflect the views of GASP.

Our world has always been a highly intertwined system of complexities but we seem, perhaps out of necessity, to have a sharpened sense of awareness of the price we routinely pay for the lifestyles we enjoy. Or maybe until recently we just didn't have the technology available to examine the consequences. Whatever the reasons, the adage of "No free lunches" comes to mind. This is the first article in a series focused on just one small, but significant aspect of that price: The growing problem of environmental mercury poisoning right here in Pittsburgh. Where does mercury contamination come from? How significant is it? Is the problem getting bigger or smaller? What are the symptoms, and what can we do about it? That's a full menu of issues. To begin, let's talk about where this growing scourge comes from.

The Sources

According to the Pennsylvania Electric Power Generation Association, there are presently 128 power generation plants across Pennsylvania producing 46,475 megawatts of electricity annually for our state.¹ On the basis of percentage of fuel used to generate that electricity, coal-fired plants are by far the most significant, accounting for 49% of total generated megawatts.² The predominance of coal-fired electricity generation in Pennsylvania is a two edged sword. The up side is economic (we have lots of coal so the cost is relatively cheap), whereas the down side is health and harm to the environment. We thus pay a long-term price for a short-term gain. Burning coal produces fine particulate matter pollution. These particles can get deep into the lungs and cause significant health problems. The particles come from a wide range of smoke sources—power plants, as well as industry, cars, trucks, buses, wood stoves and forest fires. Burning coal also produces sulfur dioxide (which converts to sulfuric acid and then comes down as acid rain), carbon dioxide (which traps heat and thus contributes to global warming), and mercury that falls from the air and accumulates in streams and the oceans.³ Bacteria in the water cause chemical changes that transform mercury into highly toxic methylmercury. We ingest mercury in the food we eat. Fish absorb the methylmercury as they feed in these waters and

we eat the fish. Methylmercury builds up more in some fish than others depending on what they eat, how long they live, and how high up the food chain they are. The main source of mercury in humans comes from consuming big predator fish such as swordfish, shark, king mackerel, tilefish and albacore tuna, according to the EPA. A guide for which fish to eat and which to avoid is available from the Monterey Bay Aquarium: Northeast Seafood Guide 2007 (see www.seafoodwatch.org for further information).

Air, of course, moves. What is generated in one place is redistributed to another downwind. Since the jet-stream moves from west to east, in Pennsylvania not only do we get whatever air pollutants we produce, but we also receive whatever is produced upwind (to the west of us). We might take some false comfort in thinking that since we live in western Pennsylvania we don't need to worry about the pollution generated throughout the state. That is wishful thinking. Ohio sits immediately to our west and is the fourth-largest producer of carbon emissions in the United States.⁴

Air does not recognize nor respect state boundaries, nor national ones for that matter. It just moves. To put this in global perspective, a recent Associated Press article reported that scientists have begun to measure significant levels of airborne pollution coming all the way from China to the United States.⁵ According to Professor Dan Jaffe (University of Washington-Bothell Professor of Atmospheric and Environmental Chemistry), "By looking at the ratios of different pollutants, particularly carbon monoxide and mercury, we can actually say the ratio of these pollutants we are seeing here at Mount Bachelor (Oregon) matches the ratio of pollutants coming right out of China."

China now emits more carbon dioxide than any other nation. But scientists working on mountaintops, with computer models and with aircraft stuffed with instruments are also worried about the effects of these lesser-known pollutants here (e.g. mercury). "One might think of these sources as small in terms of their contribution. But it's a contribution on top of what we already have," said John D. Spengler, professor of environmental health and human habitation at the Harvard School of Public Health. In addition to airborne

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GASP at the Three Rivers Arts Festival

GASP co-sponsored a sculpture highlighting the environmental effects of global warming that was part of the "Best of Pittsburgh 2007" exhibit. "Tip of the Iceberg: Species in solidarity against climate change" created by Chris Lisowski was a hit with festival goers young and old. It also appeared at the Pittsburgh Children's Museum where this picture was taken.



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sources, mercury also enters our food chain through landfill. According to a recent report by Gina-Marie Cheeseman, it is estimated that we use more than one million plastic bags every minute of every day, 365 days a year.⁶ That's more than 518 trillion globally and the numbers are increasing. The majority of these bags are consumed in North America and Western Europe. Most end up in landfills, which seep pollutants into our water supply. It takes as much as 1,000 years for these bags to degrade, and they contain chemicals that you and your children would not want to ingest. These include harmful compounds like cadmium, mercury and carcinogenic diethylhexyl phthalate.

It is abundantly clear that toxic mercury is a ubiquitous and ever increasing consequence of our modern lifestyle. All nations demand cheap energy and we routinely trade off the consequences of tomorrow for short term gains, forgetting about the price we are paying. In the next issue we'll take an in-depth look into that price and begin to address some alternatives.

1. Pennsylvania Electric Power Generation Association, 800 N. 3rd Street, Harrisburg, PA 17102
2. 45.4% coal plus 3.1% waste coal
3. According to a recent report by the Environmental Integrity Project, three of the most mercury polluting power plants in the country are located in Pennsylvania. They are Reliant Energy Mid-Atlantic (Shawville), Armstrong Power Station (Allegheny Energy) and Allegheny Energy Supply (Hatsfield Ferry).
4. Amy Gomberg, spokesperson for Environment Ohio. Coal-fired power plants release most of those emissions which include mercury.
5. "Researchers Track Dust, Soot From China" <http://www.forbes.com/feeds/ap/2007/07/13/ap3912971.html>
6. http://onlinejournal.com/artman/publish/article_2127.shtml

For the past 30 years, John Jones has been a passionate advocate for the environment which he considers our "shared home." He is concerned to the point of dismay over the disparity between the inevitable environmental trends which surround us and the chronic apathy he experiences. Mr. Jones considers himself a "student of life" and does what he can to heighten environmental awareness and responsible action.

Education Corner

For more information or to sign up for any of the programs below, contact Lee Szymkiewicz at 412-325-7382 or lee@gasp-pgh.org.

GASPer Air Monitor

It's that time of year again! The GASPer Air Monitor Program is back.

The GASPer Air Monitor is back and better than ever. Thanks to a generous grant from the Grable Foundation, GASP has been able to purchase a new air monitor. The monitor will be available again, for use by middle and high school teachers, college classes, and the community in November. Among other capabilities, the GASPer Air Monitor measures ozone, nitrogen dioxide, carbon monoxide and solar radiation. In addition, GASP also lends out a hand-held particulate monitor.

GASP Fall 2007 Teacher Workshops

Fueling the Future: Transportation Pollution & Alternative Fuels (3.5 Act 48 hours)

Ever wonder how transportation pollution affects our lives? With the help of Steel City Biofuels and funding provided by the EPA, this workshop will address environmental and health hazards associated with diesel and gasoline powered motor vehicles. Topics covered include an introduction to alternative fuels such as biodiesel, hybrid vehicles, idling regulations, GASP air monitors, carpooling and other strategies for reducing the impact of motor vehicles. One lucky teacher will go home with their own biodiesel production kit!

Saturday, Oct. 20th	Wightman School Community Building, Squirrel Hill
Saturday, Oct. 27th	Wightman School Community Building, Squirrel Hill
Saturday, Nov. 3rd	Crooked Creek Environmental Center, Ford City

Air, Art & Life: A Multidisciplinary Approach to Air Quality in the Pittsburgh Region (4 Act 48 hours)

With funding provided by the PA DEP, this workshop will examine the connection between the Donora Smog Disaster of 1948 and current air quality regulations and concerns in Southwestern PA. Science, art and regional history will be used to provide teachers with a strong background in air quality as well as exciting ways to present the information in the classroom.

Saturday, Oct. 6th	Conservation Consultants, Inc., South Side
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\$10 fee per workshop. Food will be provided. The registration form can be found at <http://www.gasp-pgh.org/teacherworkshops2007.html>. In addition to these scheduled workshops, GASP can also conduct workshops at school district-wide in-service days.

Switchgrass Farm Tour

Wednesday, October 17, 2007 – rain make-up day Oct. 19

10AM-2PM

Join Tom Stickle, Director of the Switchgrass for Bioenergy Project, as he takes us on a walking tour of Monona Farms, near Ligonier. His 500-acre switchgrass farm is the only Conservation Reserve farm in Pennsylvania devoted to switchgrass research. Mr. Stickle will speak about various aspects of his ongoing research into this plant-based form of renewable energy. Lunch will be provided. Carpooling from the GASP office may be available. Space limited to 15 participants.

Predictable Funding: Myth or Reality?

by Marilyn Skolnick, GASP Board Member

Act 44 of 2007 was passed into law by the state legislature. It was supposed to provide predictable funding for all transit providers in Pennsylvania, but a funny thing happened during the writing: it never produced the needed funding. The Governor's Transportation Funding and Reform Commission indicated that at a minimum \$760 million would be needed. However, Act 44 would only, under the best of circumstances, provide \$300 million for the fiscal year 2007-2008. The funding would increase \$50 million annually thereafter until 2010-2011 when it would increase from \$400 million by 2.5% annually.

Revenue to PennDOT to provide the needed funding would come from:

- tolling I-80
- toll revenue generated from the mainline of the turnpike (tolls to increase by 25% in 2009 and 3% each year after)
- debt financing
- savings due to I-80 maintenance and capitol costs being paid for from toll revenue

The funding for transit will be deposited into a Public Transportation Trust Fund. Funds that came from the General Fund are replaced with a dedicated portion of the Sales and Use Tax to "ensure that transit programs will have a reliable and growing funding source for the future."

Act 44 establishes five major programs for transit:

- Operating program
- Capitol improvement
- Asset Improvement Program (discretionary capitol)
- New Initiatives Program
- Programs of Statewide Significance (i.e. persons with disabilities, welfare to work, job access reverse commute, intercity bus and rail service, etc.)

Once Act 44 was announced, two congressmen from the rural section of the state indicated that they would introduce legislation to prevent the tolling of I-80 on the grounds that it would penalize their constituents who were automobile users, and not users of transit. There is, in reality, transit service in every county, although it's not the same as the transit provided in more urban areas.

According to the Pennsylvania Department of Revenue, well over half of all Pennsylvania's tax revenue comes from just six of the state's 67 counties. They are: Allegheny, Philadelphia, Montgomery, Bucks, Delaware and Chester counties. None of the rural counties provide much of any taxes, notwithstanding the protests of the two congressmen.

Because there was not enough funding provided and the Port Authority must produce a balanced budget, the Port Authority was forced to cut service and reduce staff. In addition, the County Chief Executive announced that the county would not provide its matching funding to the Port Authority unless it further reduces the "fat." As a result, it remains up in the air if the county will make the needed match after this fiscal year. In a special effort for Allegheny County, the county could levy two new taxes, one on liquor and one on rental cars. The affected constituents are voicing objections. To add to the muddle, the PAT union contract is up in 2008, right around Christmas.

While Act 44 was supposed to provide predictable funding, we can see that the funds are predictable but completely inadequate. Stay tuned. 



Cleaner, Greener Transportation in Pittsburgh

We've selected a few photos taken in Pittsburgh that represent efforts made to encourage more sustainable transportation. If you would like to submit photos for a future Hotline issue, along the transportation theme or any other air quality topic, please email hotline@gasp-pgh.org.



PHOTO: MARILIA FERRENCY

Pittsburgh is home to six hybrid gas-electric buses, one of which was featured at GASP's Drive Cleaner Drive Greener event in May 2007



PHOTO: MARILIA FERRENCY

Several hybrid vehicles on display at this year's Drive Cleaner Drive Greener



PHOTO: JONATHAN NADLE

At Pittsburgh's 30th Annual Great Race, Adidas' promotional vehicle was powered by biodiesel fuel

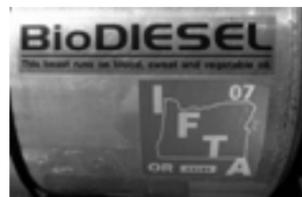


PHOTO: JONATHAN NADLE

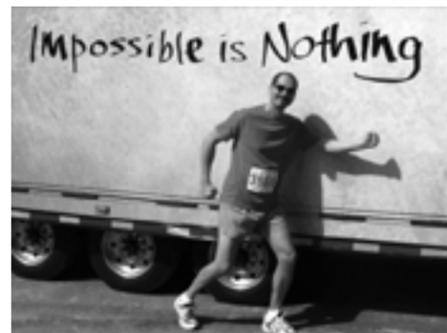


PHOTO: LORI NADLE

GASP President Jonathan Nadle runs on human power, pictured here in front of the biodiesel vehicle at this year's Great Race



PHOTO: MARILIA FERRENCY

Liberty Avenue in Bloomfield features newly painted bike lanes

Cardiovascular Disease continued from page 1

awareness that our cardiac risk is determined not only by our genes and factors which are under our control, such as cholesterol and smoking, but also by environmental exposures beyond individual control.

Research in the last few years has also given us insight into how this process occurs. A significant number of the particles in PM 2.5 pollution are ultrafine, i.e. between 10 and 100 nanometers (0.01 - 0.1 micrometers), and thus belong to the category of nanoparticles, which are defined as having at least one dimension less than 100 nm. In 2002, Nemmar et al demonstrated that radioactively labeled ultrafine particles easily crossed lung membranes to enter the bloodstream and thereby gain access to the entire vascular system.² The small size of these nanoparticles also gives them unique properties (in this case, toxicities), due to their large surface area to size ratio.

The mechanism by which these ultrafine particles trigger heart disease once in the bloodstream is also being clarified. Mills et al demonstrated that both vascular dysfunction and impaired clot breakdown activity, i.e. fibrinolysis, could be measured in healthy men exposed to diluted diesel exhaust for one hour.³ A Finnish study by Pekkanen et al, done in adults with stable known coronary artery disease, revealed increased risk for ST segment depression during treadmill testing, (ST depression is a marker for coronary ischemia), when testing was done while ambient levels of ultrafine particulate pollution were increased.⁴ Most recently, Mills, Tornqvist et al demonstrated that men with stable coronary artery disease had a threefold increase in silent ischemia both at rest and with moderate exercise, measured by degree of ST depression, while breathing air containing dilute diesel exhaust controlled to reproduce typical traffic exposures, compared to filtered air. They also found that the subjects had a decrease in a marker for fibrinolysis six hours following the exposure to dilute exhaust. They thus conclude that increased ischemia and thrombosis are two mechanisms by which fine particulate exposure increases risk of cardiovascular events.⁵

Other studies before and after the NEJM article have corroborated its findings. A study in Germany, published in July 2007, found that the distance of a person's home from a major road, ranging from >200 m to within 50 m, was associated with their risk for a high level of coronary artery calcification.⁶ This relationship was noted only in people who had not been working full time for at least 5 years, so one can assume the subjects spent more time at home, increasing the validity of the investigators' study.

Will a particular home zip code, city of residence, or

distance of one's home from a major street someday influence our recommendations to patients on an individual level, in the same manner as counseling regarding lifestyle changes for lipids and smoking? Probably not in the foreseeable future, since our home or city of residence is not easily changed. Rather, these findings must trigger a call for community-wide public health intervention. If awareness among the public increases to a level where pressure on both polluters and regulators is increased and measures are taken to improve a community's exposure, this will benefit all who work and reside there.

We can draw some local implications from these studies. While Pittsburghers are proud of the improvements they have seen in local air quality over the past few decades, a look at readings at Allegheny County monitors used in the landmark NEJM study gives us an idea of the work ahead. Data obtained in 2000 from 12 monitors in Allegheny County were used in the study. Readings from these same monitors in 2006 still ranged between 11.1 ug/m³ in South Fayette and 19.0 ug/m³ in Liberty.⁷ While only those monitors in Liberty and North Braddock exceeded the EPA standard of 15 ug/m³, the study shows us that significant cardiac effects from air pollution still exist for residents of Allegheny County. By working together to reduce these readings, we can reduce cardiac risk for all in Allegheny County. The significance of the NEJM article can thus be translated into action on a local level. GASP, through its educational outreach and efforts to monitor air quality regulators and local industry in Pittsburgh, plays a significant role in this endeavor.

1. Miller, K.A., et al., Long-term exposure to air pollution and incidence of cardiovascular events in women. *N Engl J Med*, 2007. 356(5): p. 447-58.
2. Nemmar, A., et al., Passage of inhaled particles into the blood circulation in humans. *Circulation*, 2002. 105(4): p. 411-4.
3. Mills, N.L., et al., Diesel exhaust inhalation causes vascular dysfunction and impaired endogenous fibrinolysis. *Circulation*, 2005. 112(25): p. 3930-6.
4. Pekkanen, J., et al., Particulate air pollution and risk of ST-segment depression during repeated submaximal exercise tests among subjects with coronary heart disease: the Exposure and Risk Assessment for Fine and Ultrafine Particles in Ambient Air (ULTRA) study. *Circulation*, 2002. 106(8): p. 933-8.
5. Mills, N.L. et al., Ischemic and Thrombotic Effects of Dilute Diesel-Exhaust Inhalation in Men with Coronary Heart Disease. *N Eng J Med*, 2007. 357(11): p. 1075-82.
6. Hoffmann, B., et al., Residential exposure to traffic is associated with coronary atherosclerosis. *Circulation*, 2007. 116(5): p. 489-96.
7. AirData - Monitor Values Report - Criteria Air Pollutants 2007, US Environmental Protection Agency.



Nanotechnology
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energetic debate about health effects of debris from weapons incorporating depleted uranium (DU). DU in projectiles ignites on impact and much is transformed into an aerosol of very fine U238 particles. This radioactive, toxic fine material can be deeply inhaled and also spreads easily in the wind. Most of the research on uranium has been done on uranium dust in mines and mills, and this has been applied to potential health effects of the DU aerosol, but uranium dust particles are much larger and don't generally penetrate the deep lung.¹ This argument and many other complexities fuel an ongoing debate. NATO, the Rand Corporation, the European Commission, and the World Health Organization found no evidence of adverse health effects from DU. A new report on DU is expected in October 2007 from the Department of Defense.

On a parallel track to growing concern about the health effects of inhaling existing or incidentally produced small particles is the surging field of nanotechnology wherein scientists, engineers and medical researchers are avidly creating nanoscaled particles. *Nanotechnology* creates engineered structures with diameters between about 1–100 nanometers. These devices and systems produced by chemical and/or physical processes have specific properties not displayed in their macro-scale counterparts.²

The two terms “ultrafine” and “nanoparticle,” although indicating similar <100nm diameter particles, are used to differentiate between particles not intentionally produced (ultrafine particles) like smoke, and those engineered (nanoparticles) with size-dependent physiochemical properties. However, these two definitions are not rigid.

The enormous excitement about nanotechnology exists because the nanomaterials often have different properties from their macro counterparts. Such differences may include altered magnetic, electrical, chemical, optical or biologic activity, and increased structural strength. Given these differing attributes, the scientific and medical communities are enthusiastically exploring designs for new and better consumer products, medicines and investigational tools. The global market for products containing nanomaterials is expected to reach at least one trillion US dollars by 2015. The National Science Foundation estimates that 2 million workers will be needed to support nanotechnology industries worldwide within 15 years.

Some nanotechnology products that are already on the market include paints, coatings for eyeglasses and cars, sunscreens, sporting goods, cosmetics, personal care items, stain resistant clothing, and light emitting diodes. Thousands of tons of these materials are produced each year. A listing and description of 500+ current nanotechnology-based consumer products can be seen at:

www.nanotechproject.org/consumerproducts.

On the cutting edge of technology, IBM scientists recently established that it is possible to measure the magnetic direction of a single atom. This allows for the possibility of storing data bits on an individual atom, or at least a small cluster of atoms. That would allow nearly 30,000 feature length movies or the entire contents of You Tube (more than 1,000 trillion bits) on a device the size of an iPod, IBM officials said.

On the medical front, a new cancer therapy focuses on nanoshells. The inner core of this particle is made out of glass and the outer shell is made out of gold. These nanoparticles can absorb infrared light and convert it to heat. The elevated heat of about 10 to 20 degrees will induce nearby cell death. Placed in or next to tumor cells, the increased heat will induce tumor cell death. Infrared light can be shown through the skin and the nanoshells can be delivered through the bloodstream. This procedure, while in its early stages, has shown good results in animals. Human trials may be scheduled this year.³

Obviously there is great benefit to be had from nanotechnology, but because the potential toxicity of nano-scale materials cannot be reliably predicted from their normal-scale toxicity, thorough safety assessments need to be performed.

In late 2006, the EPA took a small step towards oversight of nanomaterial products by issuing a determination to regulate any product that claimed it would kill germs by the release of nanoparticles of silver or related technology. This determination was actually a reversal of a former decision not to have oversight of nanosilver. Silver is known to bioaccumulate in some aquatic organisms and is highly toxic to aquatic life in low concentrations. Silver in normal form can kill germs and that property is magnified in the nanoscale form. According to Samuel Luoma, a senior research scientist at the U.S. Geological Survey in Menlo Park, California, silver is a powerful environmental toxin, second only to mercury in the damage to invertebrates that even trace amounts can do. There are presently almost one hundred products on the market that contain nanoscale silver.

One of the products already on the market when EPA undertook this oversight was a “Silver Wash” clothes washer that released nanoparticles of charged silver to sanitize clothes during the wash cycle. Another use of nanosilver is in bandages to speed healing, but that would come under the regulatory control of the Food and Drug Administration (FDA) because it is applied to the body. The EPA would regulate the “Silver Wash” clothes washer under the Federal Insecticide, Fungicide, and Rodenticide Act as a pesticide, but only if there was an antibacterial claim. After this EPA announcement, some manufacturers changed their advertis-

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ing claims from “antibacterial” to “stays fresh longer,” and thereby escaping any oversight. Confused? It seems the regulating agencies are as well as they try to get a grip on who should regulate what, and how to assess the risk of various nanomaterials.

The FDA is regrettably just getting its feet wet in the area of nanomaterial regulation. Recent federal reports have recommended the FDA and other federal agencies rapidly develop strategies and methodologies to assure the safety of nanoscale products as this growing technology surges forward. Unfortunately, the FDA has been severely limited by lack of funding and a limited amount of risk research data. It is critical that the federal government provide adequate safety oversight and not lag behind amazing new nano product developments.

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1. A summary of article by Science Team Member Gretel Munroe, of the International Coalition to Ban Depleted Uranium, article by Rosalie Bertell, “Depleted Uranium: All The Questions About DU and Gulf War Syndrome Are Not Yet Answered,” International Journal of Health Sciences Volume 36, #3, November 2006.

2. EPA uses the definition of the National Nanotechnology Initiative (NNI) (a federal R&D program established to coordinate the multiagency efforts in nanoscale science engineering, and technology). The NNI calls it “nanotechnology” only if it involves all of the following: 1) research and technology development at the atomic, molecular or macromolecular levels in the length scale of approximately 1–100 nanometer range 2) creating and using structures, devices and systems that have novel properties and functions because of their small and/or intermediate size. 3) ability to control or manipulate on the atomic scale.

3. http://www.nanotechbuzz.com/50226711/nanoknife_nanoshells_kill_cancer_tumors.php and <http://edition.cnn.com/2007/TECH/science/06/11/halas.vision/>



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Friday, November 2, 2007

7:00-10:00 PM

Khalil's II Restaurant

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