

Partnership between the University of Pennsylvania and the Decatur Community Association

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We heard about the CCPH Award via the CCPH e-mail list.

Abstract: The Little Hocking That Could

In 2002, Dr. Zhang, a PENN resident working in Parkersburg, West Virginia and Dr. Emmett learned that C8 was contaminating water of the Little Hocking Water Association (LHWA) in Southeastern Ohio. The C8, a chemical not found in nature, came from a production facility in nearby West Virginia. EPA declared C8 a probable human carcinogen and is concerned that it may delay childhood development. Concern in the LHWA about effects of C8 was heightened by various information disparities between the community, regulators and industry. In response, PENN, the local community, and the local physician Dr. Zhang formed an Environmental Justice partnership which obtained funding for an independent community-based participatory research study to determine 1) if levels of C8 were elevated in the blood of LHWA residents, 2) whether the source of C8 was from air, water, or elsewhere and 3) if there were any short-term health effects. The study found that C8 levels in residents were far above normal, and highest in children and the elderly. The major source of C8 was residential drinking water—C8 in the air did not play a role. On the day of the Community Meeting to report detailed results, DuPont announced it would supply free bottled water to LHWA water users. 78% of eligible households accepted this offer. In late 2006, we performed a follow-up study of 65% of the original participants. Over 90% had made some change in their water supply, and C8 levels had fallen an average of 25%. The community was empowered.

List of Partners

Major Partners

1) University of Pennsylvania – Dr Edward Emmett, is a Physician and Professor in Occupational and Environmental Medicine, Deputy Center Director and Director of the Community Outreach and Education Core for the Center of Excellence in Environmental Toxicology, and Director of the Residency Program in Occupational & Environmental Medicine at the University of Pennsylvania, School of Medicine.

2) Decatur Community Association (David Freeman Trustee) – The Decatur Community Association is a non-profit community association established in the 1950's that provides various community gatherings, sponsors the neighborhood crime watch and the local 4H, and hosts various community events. It is governed by a Slate of Officers and five members of a Board of Trustees.

3) Dr. Hong Zhang – Dr. Zhang was working in Parkersburg, West Virginia as a resident in the Occupational and Environmental Medicine residency training program at the University of Pennsylvania. This program has a unique community-academic partnership training model and requires residents to complete Environmental Health projects that involve community stakeholders.

4) Dr. Nancy Rodway – Dr. Rodway was working in Chillicothe, in Southeastern Ohio and was also a resident in the Occupational and Environmental Medicine residency training program at the University of Pennsylvania. As noted above, this training program has a unique community-academic partnership training model and requires residents to complete Environmental Health projects that involve community stakeholders.

Other Partners (Members of Community Advisory Committee)

Mary Dominiak - United States EPA

Steve Williams - Ohio EPA

Sarah Wallace - Ohio EPA

Kathleen Meckstroth - Washington County Health Department

Ellen Mumma - Community Coordinator

Sidney Brackenridge - Warren Local Schools

Molly Varner - Wesley Township

John Hannan - Barlow Township

Tom Neill - Watertown Township

Larry Miskimins - Fairfield Township

John Smith - Belpre Township

Robert Layfield - Decatur Township

Gregory Nicholson - Palmer Township

Ron Curry - Dunham Township

Mary Hufford – University of Pennsylvania

Essay

1) What is the history/background of how and why your partnership started?

The involvement of the University of Pennsylvania (PENN) in the C8 levels of Little Hocking residents began because of a unique community-based training program whereby PENN trains physicians to be specialists in Occupational and Environmental Medicine. This Occupational and Environmental Medicine Residency program is designed for physicians who have completed clinical training and have full-time employment in occupational medicine. The site and community must offer suitable clinical training opportunities and some local supervision, and can be anywhere in the United States. Elements of this training program include supervised activities at the work-site(s), visits to the location by program faculty (normally based in Philadelphia), and monthly 3-day visits by the residents to the University of Pennsylvania in Philadelphia. During the Philadelphia sessions residents receive intensive training in a variety of topics as well as participating in journal clubs, grand rounds, demonstrations and other didactic activities. As part of the program each resident must complete and present five in-depth projects which are useful to their employer, and/or the community in which they live. One of those projects must be in the area of environmental health and focus on risk assessment and risk communication. For this and other projects, effective work with community stakeholders is a requirement. The residency class usually has 7 to 8 residents per year from all over the U.S. Over the period of 10 years, over 70 physicians have participated in and successfully graduated from the program. The program is fully accredited by the ACGME, the accrediting body for residency training. Residents from this program have a much better than average record in the American Board of Preventive Medicine specialty examinations. Surveys of graduates have shown high satisfaction with the training, and that most residents remain in the communities in which they trained. Most are serving in regions of substantial medical need, and are located outside the 25 largest SMSA areas. The program is partially supported by a training grant from the National Institute of Occupational Safety and Health (NIOSH). These training funds are awarded to residents on the basis of community need rather than personal accomplishment.

In 2002 Dr. Hong Zhang, a resident in the Occupational and Environmental Medicine Residency at PENN (supported by the training grant from NIOSH), was located in Parkersburg, West Virginia. Both Dr Zhang and Dr. Emmett, the training program Director, learned of C8 levels in the water of the Little Hocking Water Association (LHWA), in Appalachian Southeastern Ohio. LHWA is a rural water district serving approximately 13,000 people in an economically deprived area. The source of C8 was a production facility in nearby West Virginia. C8 is the local name given to the chemical perfluorooctanoic acid, usually referred to in the scientific literature as PFOA. C8, a man-made chemical not found in nature, is used in the production of Teflon but also has other uses. Small amounts of C8 are now found in the blood of almost all humans, though before our partnership had identified the sources in the Little Hocking population, the source for this C8 was unknown. Based on animal toxicology studies, the EPA has declared C8 a probable human carcinogen and is concerned that it may delay childhood development. In rats C8 causes cancers of the liver, pancreas and testes, although there is uncertainty as to whether these effects occur in humans. C8 is persistent in the environment and does not break down in nature. Increasingly C8 is being discovered in wildlife, even including organisms in the middle of the Pacific Ocean. C8 is persistent and long-lived in humans with a half-life in blood of about 4 years.

Drs. Zhang and Emmett believed that the situation involved many elements of Environmental Justice. An Executive Order signed by the president of the U.S. on February 11, 1994 had made achieving environmental justice part of the mission of every federal agency. Each agency was to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects on minority populations and low income populations. The LHWA is located in the low-income Appalachia Region and is therefore appropriate for efforts to achieve environmental justice.

Washington County, Ohio, in which 90% of the residents of LHWA are situated, is one of 12 Eastern Ohio counties which are officially recognized as part of Appalachia (and for statistical purposes assigned to the Northern Appalachia Region). The other approximately 10% of LHWA residents are in Athens county, also officially in Appalachia. According to the Appalachian Regional Council, the per capita income for Washington County in 1999 was only 78% of the average for the US and the per-capita market income was 75% of the US average. For 1997–1999 the three year average unemployment rate was 5.8%, compared with 4.6% for the US as a whole. The mean per capita income and per capita market income for Washington County were both below those for the whole Appalachian region in 1999, and the unemployment rate was higher in Washington County than in Appalachia as a whole. Environmental justice refers to the need to remedy the unequal burden of exposure and disease borne by socioeconomically disadvantaged persons and caused by residential exposure to greater than acceptable levels of environmental pollution, exposure to occupational hazards, and fewer civic benefits such as sewage and water treatment. Geographic location plays an important role in environmental exposure of socioeconomically disadvantaged persons. Scholars of the region argue that Appalachia is such a location due to federal policies that have sanctioned environmental injustice. Environmental justice also entails fair treatment of all groups of people and meaningful involvement of all affected groups in decisions involving them.

Residents of Southeastern Ohio and West Virginia are heavily exposed to environmental contamination by pollutants known to be hazardous to human health, as a result of the heavy industrialization and the concentration of chemical industry in West Virginia. The C8 exposure in the LHWA also involved some particularly vexing environmental justice issues for the LHWA residents. The air and groundwater contamination by C8 to which LHWA residents are exposed, is generated from the Washington Works Plant in West Virginia. Not only are those who generate the pollution and those who have the greatest exposure to it in different counties, they are also in different states and therefore under the jurisdictions of different state Environmental Protection and Health Departments. This issue was compounded by the fact that the two states are also in different Federal EPA and Health and Human Services Regions. These unfortunate geographic and political differences limited the impact of LHWA input on decisions which affected its residents.

The marked concern in the LHWA about the possible effects of C8, was heightened by information disparities such as: the revelation that C8 had been in the water for many years but had not been disclosed, the inability of the water association to independently test the water for C8, and unexplained increases in the level of C8 in water that the West Virginia Department of the Environment considered to be safe. In fact, increases in the “safe level” appeared to coincide with the discovery of increasing C8 concentrations in the LHWA water.

To address this situation, an Environmental Justice partnership was formed between PENN, the local community, and the local physician Dr. Zhang. This partnership successfully obtained an Environmental Justice Grant from the National Institute of Environmental Health Sciences. The purpose was to perform an independent community-based study to determine 1) if levels of C8 were elevated in the blood of LHWA residents, 2) if so, whether the source of C8 was from air, water, or something else, and 3) if there were any short-term health effects (cancer and developmental defects would need to be studied later).

2) What are the mission and goals of your partnership, and how were those determined?

Beginning in the summer of 2002, Dr. Emmett and Dr. Zhang held a series of meetings with interested community members about the fact that high levels of C8 had been found in the Little Hocking water system. Dr. Zhang had both patients and staff under her who were concerned about potential effects of C8 in the environment and water. At the same time, Dr. Emmett had heard from federal agencies that there was concern about C8 in the environment in the Parkersburg area where his

resident Dr. Zhang was located. Initially, the meetings with interested community members were convened at the offices of the Little Hocking Water Association. However, it soon became apparent that the water association could be a party to actions about the water supply. This consideration led us to partner with the Decatur Community Association as a community partner for further actions, including submitting an application for an Environmental Justice grant with the mission of addressing the C8 situation in the LHWA.

Substantial community distrust had been engendered by the events surrounding exposure to C8 in the Little Hocking and neighboring Parkersburg areas. We proposed to creating an Environmental Justice Partnership to perform community-based participatory research, with the goal of providing effective outcomes for the community in terms of understanding, ownership, and implementation of preventive practices to reduce exposure. These outcomes would thereby lead to an increase in community trust.

The specific aims for our community-campus partnership research were to:

- 1) Institute a collaborative partnership to link affected community, local health care providers, and environmental research scientists, and develop an effective forum for broad-based community participation.
- 2) Assess potential routes of environmental exposure to C8 in the LHWA, assess levels of C8 in the blood in a sample of the exposed population, determine the major routes of exposure in these residents, and determine if the levels of C8 were associated with adverse changes in biomarkers of health effects.
- 3) With community stakeholder participation, and based on the assessment of potential exposure routes and distribution of C8 levels in blood, develop practical interventions to reduce exposure to C8 in LHWA residents.
- 4) Communicate and disseminate the results of the research and the recommended exposure reduction intervention actions to the community, to local health care providers, and to relevant governmental authorities.
- 5) Evaluate the effectiveness of the assessment, intervention, education, and communication activities using both process and outcome measures. The outcome measures include the use of practices by the community to reduce C8 exposures of environmental health importance, reduction in blood levels of C8, and changes in the level of community confidence in the processes for assessing and monitoring exposure to environmental health risks.

The partnership decided to follow the general risk assessment and management framework developed by the Presidential/Congressional Commission on Risk Assessment and Risk Management, which is based on community stakeholder participation. The Commission defined risk management in the following way. "Risk management is the process of identifying, evaluating, selecting, and implementing actions to reduce risk to human health and to ecosystems. The goal of risk management is scientifically sound, cost-effective, integrated actions that reduce or prevent risks while taking into account social, cultural, ethical, political, and legal considerations." The Commission considered that their framework is particularly applicable: a) when the context is broader than just a single chemical in a single media, and b) is particularly appropriate to encouraging stakeholder involvement. We believed that the problem of C8 exposure in the LHWA and surrounding communities met both of these criteria. There had been a pattern of multiple and complex exposures to C8 through several media potentially impacting the residents of Little Hocking and surrounding communities. Further, it was the intent of the partnership that there be extensive and pervasive stakeholder involvement. An additional benefit of the framework is that it promotes successive phases of: defining problems and putting them in context; assessing and analyzing risks; analyzing options; making a decision; taking action; and evaluating results, all with stakeholder engagement and involvement.

Our stakeholder participation model for risk assessment, intervention and evaluation required continued effective communication among the key participants and with the community stakeholders. Effective communication with stakeholders must be two-way. Direction, input and judgments are

learned from the stakeholders, while at the same time assessment results and interpretation, technical advice, evaluation plan results, and education in environmental health concepts need to be communicated to the stakeholders. The key investigators needed to be available to answer questions from the community at all convenient times. Our communication plan was to be a living document which incorporated the objectives for communication at each phase of the activity, the target groups for communication, the media to be used for communication, member(s) of the partnership responsible for the communication, and a summary of the content. As with other partnership activities, the communication plan was subject to change based on stakeholder input.

3) How does your partnership define “community” and how do you interpret that definition in the composition, mission, goals, and activities of your partnership?

We defined community as all the people living within the boundaries of the Little Hocking Water District. These people were all potentially exposed to C8 from water in the public water system. Some were potentially exposed to C8 from the air. Some people used well, cistern, or other water sources, but these were potentially contaminated (and some were later found to be actually contaminated) with C8.

The Decatur Community Association was not just representing its own members but also the entire community as defined above. Thus all residents in the area were welcome to attend and participate in meetings, all townships served by the water system were represented on the Community Advisory Committee, and quarterly newsletters were sent to all households in the water district (regardless of whether residents received water from the Little Hocking Water Association or were members of the Community Association).

We modeled our partnership on the stakeholder model proposed by the Commission on Risk Assessment and Risk Management. This framework promotes successive phases of: defining problems and putting them in context; assessing and analyzing risks; analyzing options; making a decision; taking action; and evaluating results, all with stakeholder engagement and involvement. An effective partnership in conjunction with the use of the stakeholder model proposed by the Commission on Risk Assessment and Risk Management will ensure that: the community is aware of basic environmental/occupational health concepts, issues, and resources; the community has a role in identifying and defining problems and risks related to environmental and occupational exposures and stressors; the community is included in the dialogue and is integral in shaping research and policy approaches to the problem; and the community actively participates with researchers and health care providers in developing responses and setting priorities for education and intervention strategies.

The community was a full partner in designing the innovative model we developed for the communication of the study results.

4) What is the governance structure and decision-making process for your partnership?

The executive body of the partnership consists of the Trustee of the Decatur Community Association (David Freeman), the local physician (initially Dr. Hong Zhang, later Dr. Nancy Rodway) and the research scientist from the University of Pennsylvania (Dr Edward Emmett). Together the partnership formed a Community Advisory Committee (CAC) composed of representation from local townships within the LHWA district, State and Federal EPA, the local school district, and the County Health Department. The CAC met quarterly; all meetings were open to the public and 10-30 people usually attended in addition to CAC members. Meetings were run in a manner which encouraged participation by community members. Meetings were open to all residents and other interested stakeholders, except that attendance or participation by the polluting facility or plaintiffs lawyers were discouraged. Minutes of the meetings were posted on the website, and quarterly newsletters were sent to

all residents in the water district. The CAC was particularly crucial in creating the final design of the study, the wording of questions for the questionnaire, and the methods to communicate results. The CAC also played a vital roll in reflecting the concerns and needs of the community and providing views on progress, successes, and continuing needs for action.

A community coordinator employed by and working out of the Decatur Community association was available to the community and responsible for maintaining two-way communication. The community coordinator, Ellen Mumma, was a resident in the community with high-level communication, public relations, and writing skills.

In community-based studies there can often be issues involving “who speaks for the community.” In order to avoid such issues, the Decatur Community Association and the other partners made a continuing effort to ensure wide publicity and involvement of the community. In addition, a social scientist from the University of Pennsylvania, Mary Hufford, Ph.D., was independently brought in to evaluate participation in the Community Advisory Committee as well as attitudes of the community. The goal was to ensure that we were obtaining community-wide participation and acceptance. She reported that she could not identify any problems in this regard.

5) What funding supports your partnership and how are decisions made about (a) which funding sources to pursue, (b) what entity serves as fiscal agent, and (c) how funding is allocated?

Our partnership successfully obtained an Environmental Justice Grant from the National Institute of Environmental Health Sciences. The partnership pursues only publicly available funding sources where there would be no possibility of a perception of conflict of interest. Any funding possibility is discussed between the partners at an early stage to ensure that it would be acceptable to all. Although substantial funding may have been available to us from the sources such as the manufacturer of Teflon (DuPont Corporation) or lawyers for plaintiffs in a class action suit, we have studiously avoided any such funding. The partners believe this has been very important in creating community trust, ownership, and confidence in the results of any studies we have undertaken. Because of its superior capacity to handle federal funds, the University of Pennsylvania has served as a fiscal agent. However, each of the partners—University of Pennsylvania, Decatur Community Association, Dr. Zhang, and later Dr. Rodway—have been responsible for their own subcomponents of the budget. The funding allocation was agreed to among the partners at the time of our initial grant submission. This has worked well and there has been no reason to change the allocations. We believe that it is important for all partners to be financially independent, feel empowered, and to be responsible for their own activities.

6) What community-campus partnership strategies does your partnership pursue, and how do these help to achieve your mission and goals?

The partnership between the University and the community arose from, and was made possible by the community-academic partnership model of medical residency training in Occupational and Environmental Medicine at the University of Pennsylvania School of Medicine (see full description in question 1)). We are continuing the involvement of PENN students in this community. Currently, Lynda Nolan, a student in the MPH graduate program at PENN is devoting her Capstone Project for that degree to working with the community to address birthweight and neonatal issues associated with C8 exposure. Eunice Omanga, an MS student in Environmental Science, has completed her thesis on aspects of the study. Kaitlyn Edelson from McGill University spent a month with us working on the project. In addition, several PENN undergraduate students, including Chintan Desai, John Quattrochi, Charlyn Okigbo and Amber Thornhill have assisted with the project by visiting the community and attending Community Advisory Group meetings. A goal of all of these student experiences has been education in the techniques of working with communities.

The partnership has followed the general risk assessment and management framework developed by the Presidential/Congressional Commission on Risk Assessment and Risk Management, which was based on community stakeholder participation. The Commission defined risk management in the following way: “Risk management is the process of identifying, evaluating, selecting and implementing actions to reduce risk to human health and to ecosystems. The goal of risk management is scientifically sound, cost-effective, integrated actions that reduce or prevent risks while taking into account social, cultural, ethical, political, and legal considerations.” The Commission considered their framework to be particularly applicable: a) when the context is broader than just a single chemical in a single media, and b) is particularly appropriate to encouraging stakeholder involvement. We believed that the problem of C-8 exposure in the LHWA and surrounding communities met both of these criteria. A pattern of multiple and complex exposures to C-8 via several media had potentially impacted the residents of Little Hocking and the surrounding communities. It was also the intent of the partnership that there be extensive and pervasive stakeholder involvement.

As our work together has continued, we have found that new strategies were needed, particularly in the area of communication of results and risk communication. For example, through meeting with the Community Advisory Group prior to the results being available, we determined the principles that should govern feedback of results to the participants and the community, the principle target groups for communication, and the necessary communication processes. The principles and target groups we decided on are outlined below.

Principles to Govern the Feedback of Results to the Community:

- Individual participants should receive their results first; to avoid participants first learning results from the press, neighbors or friends.
- The press should be informed in a timely way, and in a manner that the investigators control the message as far as possible.
- Results should be released promptly, but not before the investigators were comfortable to do so.
- Questions from individuals should be answered promptly
- The study must remain a credible source of information
- Communications should maximize constructive responses to the findings
- Communications should minimize pointless concern.

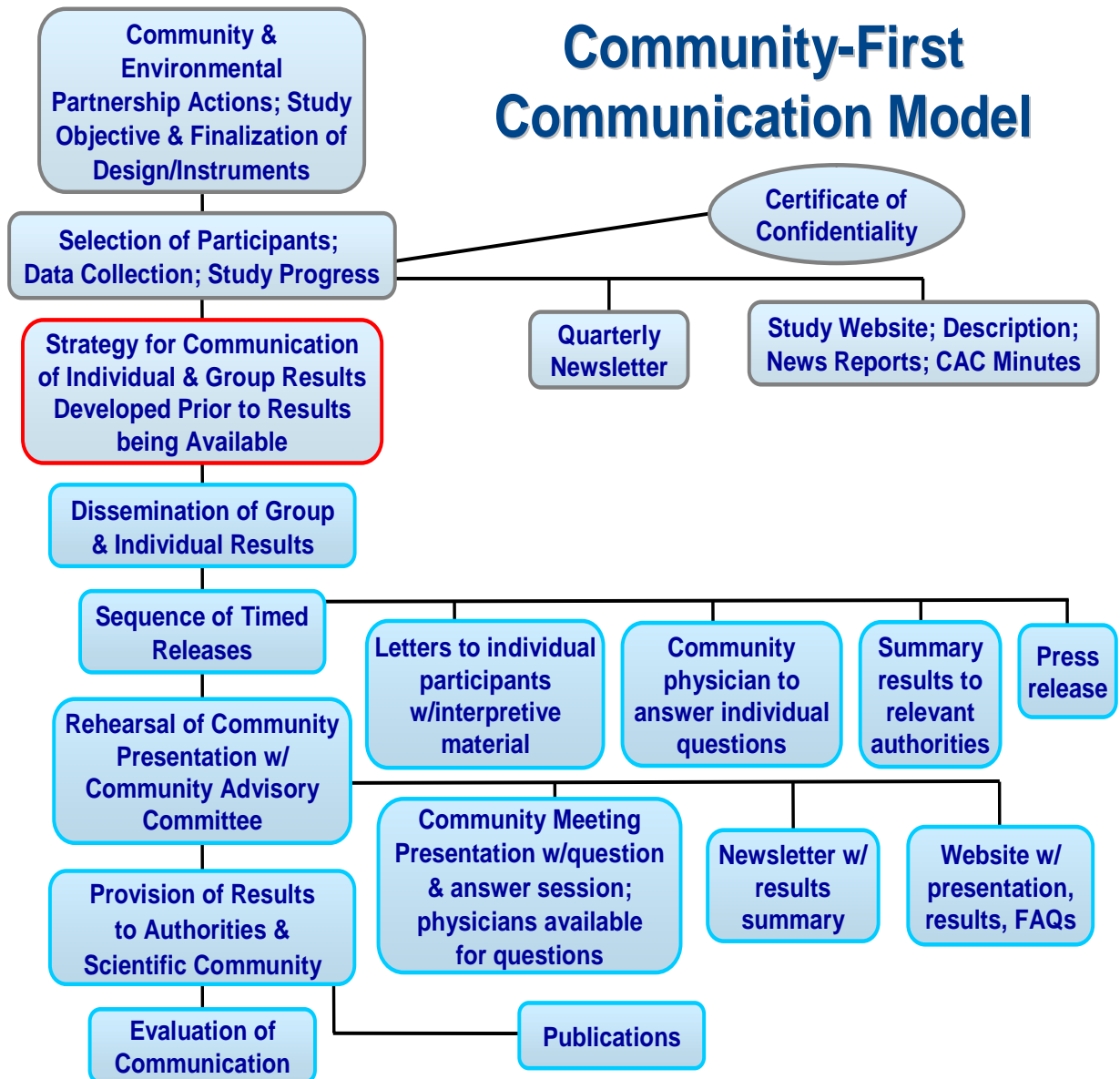
Target Groups (in order of priority for the community):

- 1) Study Participants
- 2) The community i.e. residents of the water district
- 3) Community Advisory Committee
- 4) Relevant Authorities and Representatives (County and State Health Departments, State Department of Environment, local water authorities, State and Federal elected government representatives for the area, Local Townships, Sheriffs Departments)
- 5) Local Medical Providers
- 6) Local Media
- 7) National media, as necessary
- 8) Scientific Community

Implementation of Communication Model

The method of feedback we used proved extremely effective, and appears to have worked as well or better than more traditional models. We have named this innovative method of disseminating results the “Community-First Communication Model.” The principle components are shown in the figure below. The essence of this model is that instead of publishing the results in scientific journals and

allowing the results to trickle down to the community, once we had established that the findings were scientifically valid, we released them first to the participants in the study and then to the community. Our partnership believes that the resulting community ownership of the results altered the balance of power within the community, and led to the voluntary decision of the chemical facility to provide free bottled water to those served by the water supply. We believe it also contributed to the high acceptance by the community of the recommendation to substitute non-contaminated water for water with high C8 levels.



7) How does your partnership assess and reflect on progress towards your mission and goals?

Our partnership has assessed and reflected on progress toward our goals in several ways. Initially, we held a conference call every month or so between Dr. Emmett, David Freeman and Ellen Mumma from the Decatur Community Association, Dr. Zhang, and others to discuss the partnership and assess progress and events. As time passed, this became less essential, and we now only conduct a conference call when one of the parties sees a need for it.

A principle vehicle for assessment and discussion of progress has been the quarterly meetings of the Community Advisory Committee. Regular items on the agenda have been the evaluation of progress as well as developments in the community. A number of subjects are generally discussed, which include:

- Unfolding events involving the US and Ohio EPA, the Health Department, the Little Hocking Water Association, and other institutions.
- Developments in relation to our studies, communication, or results.
- The “pulse” of the community with respect to C8.

As required, specific strategies and plans are discussed. For example the successful “Community First” communication strategy was developed through discussions at Quarterly CAC meetings. At these meetings there is open and broad participation in the discussion by both members of the Committee and other residents in attendance.

In addition, we have provided Annual Progress reports for our Environmental Justice grant to the NIEHS. Each of the partners was also required to present at an annual meeting for all of the Environmental Justice and Community-Based Participatory Research grantees. Our preparations for these meetings and reports have stimulated review and reflection on our achievements, areas requiring action, and future plans.

8) What outcomes or results have been achieved by your partnership and what evidence can you provide to support these?

This project has resulted in numerous demonstrated results: 1) Showing that the major source of human exposure to C8 was through public and private water sources; 2) Identifying that levels were highest in children and elderly in the community; 3) Provoking the voluntary offer of free bottled water for use whenever water is ingested to substitute for public water supplies contaminated with C8; 4) Stimulating a very high proportion of residents to accept the bottled water offer or to make other changes in their residential water source, as shown by our follow-up survey; 5) Reduction in C8 emissions from the plant during the period of our partnership; 6) Empowerment of a small rural community.

The effectiveness of our efforts is measured by the 25% reduction in blood C8 levels from late 2004 to late 2006. This is a substantial reduction given the long life of C8 in the body, which has a half-life of over 4 years. The reductions in exposure and in levels in the blood of residents will help reduce the possibilities of developmental effects and cancer that EPA believes may occur from C8 exposure. The design of this study and its communication model was highly effective, and can be replicated elsewhere. A study about to be published from Germany confirms our observation that water was the source of C8 exposure in another contaminated community. Other studies are in progress in the U.S.

The sustainability of this work is demonstrated by subsequent events and regulatory changes. On December 7, 2006 the EPA entered into a consent agreement with Dupont to provide bottled water to other communities around Little Hocking with C8 in their water. The States of Minnesota and New Jersey have developed new water standards for C8 based on our results. The results of our studies have been disseminated to the scientific community through two fast-track articles in the Journal of

Occupational and Environmental Medicine. Before this study the source of C8 in human blood was unknown. In 2005, prior to the availability of the results from our community-campus partnership, the US EPA website stated that the population source of PFOA was unclear “. . . cannot determine how people are being exposed. Whether exposures are due to PFOA in air, water, dusts, sediments in dietary sources or some combination of routes is currently unknown (EPA 2005).” Accordingly no methods or controls to reduce human levels could be recommended. Now that our partnership has identified the major source and other sources, controls to reduce levels can be implemented throughout the world.

As a result of working with the residents in the Little Hocking Water Association reticulation area in rural Appalachian Southeastern Ohio, we have achieved the following milestones:

- Determination of high levels of perfluorooctanoate (PFOA), known locally as C8, in residents' blood and identification that the major source was contamination of the public residential water supply, July-August 2005
- Communication of major results to the community, August 2005
- Voluntary offer by the facility responsible for the C8 contamination to provide free bottled water to all households in public residential water system, August 2005
- Uptake of free bottled water offer by 78% of eligible households, August–October 2005
- Some change had been made to the household residential water supply by ~95% of residents surveyed, November 2005–January 2006
- A 25% reduction in blood levels of C8 of residents noted in November 2006–February 2007 survey, with somewhat higher reductions in children
- Fast Track publication of research findings in scientific literature, August 2006
- EPA-Dupont consent agreement to provide bottled water to other communities with water supplies contaminated by C8, December 2006

9) What are the ways in which your partnership builds on each partner's strengths and balances power among partners?

We had great success with the equal partnership we formed between the Decatur Community Association, PENN, and local medical practitioners. Each of the partners contributed their own unique strengths to the partnership. The community partners had first-hand knowledge of the issue, and of the lifestyles, culture, and concerns of the community. The university had skills in research as well as in-depth knowledge about potential medical consequences and the toxicology of C8 exposure. The local physicians knew the health problems and resources available for individuals who were concerned and potentially affected by C8. The local physicians were also able to arrange and carry out medical procedures such as collection of samples in accordance with a research design developed by the University. In addition, the physicians were able to provide a continuing resource for members of the community to connect with other physicians and hospitals in the area. Community members played an important role in identifying issues of concern, or requiring research or explanation. The community advised the partnership on the appropriate terminology for survey questions about the environment and health. Incorporating this local nomenclature and knowledge improved the questionnaires administered by the researchers and ultimately led to appropriate and understandable recommendations once results were available. The relationship and interaction of the local physician and PENN were greatly facilitated through the participation of physicians in the Occupational and Environmental Medicine Residency at PENN. The training program ensured that the involvement was educationally meaningful to the local physicians and that the work was credited towards their requirements for specialty certification.

This partnership was able to obtain funding and through their mutual efforts perform a sophisticated high quality scientific study in a relatively poor rural community. Through this collaboration, we were able to overcome a number of serious information and power inequities that

previously existed between the community, the polluter, and government agencies. We were also able to identify, for the first time, the major sources of PFOA in the blood of a non-occupational population, and to affect measures to reduce that exposure. Each party was vital to these efforts—no one or two of them could have achieved these results on their own.

The partnership ultimately depended on the wisdom and local knowledge of the community, the scientific sophistication of the University, and the in-depth skills of the medical practitioners. Invaluable support and input also came from the local health department and the State and Federal EPA, who supported the core partnership, attended meetings of the CAC, and provided information and the results of water and other media sampling. These positive relationships ensured that we were always well-informed in providing answers to the community and in our studies.

10) To what do you attribute your success as a partnership?

We attribute our success to a number of factors which have all acted in concert. These include:

- Open processes, in which anyone living in the community could participate
- Open and regular communication with the community through multiple channels (meetings, newsletter and website with the community)
- Independent funding, avoiding any commitments to or support from parties that may have vested interests in the outcome.
- Working together focused on an important task, for the common good.
- Bringing complementary skills and knowledge to bear on the issues at hand.
- Mutual respect for each others skills and roles.
- A partnership of equals, composed of three parties with equally important roles and responsibilities.
- A community-first attitude.
- Trust within the community developed over time through open processes, independence from vested interests, respectful professional behavior by the parties, and a community-first attitude.

The strategies and communication models we have used and/or developed have also proven very effective including:

- The risk assessment and management framework developed by the Presidential/Congressional Commission on Risk Assessment and Risk Management, based on community stakeholder participation.
- The Community First communication model we developed for dissemination of results.
- Our community-academic partnership model for the Occupational and Environmental medicine residency training at the University of Pennsylvania

Subsequent to our results and recommendations, pride within the community has been sustained and further encouraged by the recognition our work together has achieved, including:

- First Prize award at the EPA 2006 Science Fair for our study
- Fast-track publication of our results in a well-reputed peer review journal.
- Use of our results by EPA to enter into a consent agreement with Dupont on November 20, 2006 to lower the “action level” of C8.
- Use of our results by several states to set safe drinking water limits
- The acknowledgement by Dupont that our study was good science

11) What lessons have you learned about community-campus partnerships that you believe are important to share with others?

The most important lesson we learned is that community-campus partnerships can be successful beyond the wildest dreams of the partners at the outset of the collaboration.

Other lessons we have learned are:

- The importance of listening to each other.
- The importance of respect.
- The great wisdom, balance, and perspective that resides collectively within a community.
- The importance of training health professions to have skills in working with community stakeholders as part of the professional training curriculum.
- The usefulness of community-based participatory research.
- The importance of regular, clear, timely, and multichannel communication in work with communities.
- The need for Universities to overcome academic arrogance.
- The importance and meaning of equality in a partnership between a community and an institution of higher learning, which on the surface may have quite disparate resources and interests.
- That good actions to improve one community create an example that many others can use.
- That community-university partnerships can produce more timely results in ameliorating health hazards than either legal actions or regulatory processes.
- That campuses of higher learning are ideally suited to help reverse information disparities that exist on the community level.
- That the weak, armed with information, can become strong!

12) By what process did you decide to apply for the CCPH award and draft this nomination?

We have continued to look for ways to promote Community-Campus Partnerships as a means of addressing environmental health issues, because we feel other communities can be empowered by the success of our partnership and by the strategies that worked so well for us. As we have presented our results at conferences and shared them with others, we have increasingly seen that we have a very compelling story to tell. We feel that our partnership can serve as an excellent model for communities addressing similar informational and other disparities. When we read the announcement of this award, we were excited to see that our activities fit perfectly with the award's objectives and criteria. The strengths that made our partnership so successful are the very strengths this award seeks to highlight. Our partnership has demonstrated that a Community-Campus Partnership is a powerful tool for successfully overcoming social injustice. It is for this reason that we submitted our nomination for this award.

TO: CCPH Award Evaluators
FROM: David C. Freeman, Trustee
Decatur Community Association
DATE: January 8, 2008
RE: Community-Campus Partnerships for Health Annual Award.

I offer this letter of support for the nomination of the Community C8 Study conducted in the Little Hocking Water Service District, Little Hocking, Ohio for the CCPH Annual Award. The study was a partnership between the University of Pennsylvania (Dr. Edward Emmett, Principal Investigator) and the Decatur Community Association (the community-based participant), as well as local health care providers. I served as the community liaison for the study, representing the Decatur Community Association.

I believe the Study is a strong award candidate for three reasons, which I will elaborate on below:

- The awareness and education of the affected community with regard to the C8 issue was raised, resulting in action taken by community members.
- The community was engaged over the entire course of the study.
- Collaborative problem solving was stressed.

The awareness and education of the affected community with regard to the C8 issue was raised, resulting in action taken by community members.

An increased awareness and education of the affected community is evidenced by the community's resulting behavior. Positive behavior by the primary stakeholder group in the Community C8 Study, the residents of the Little Hocking Water Service District, was clearly demonstrated by the community's uptake of bottled water made available by the corporation responsible for introducing C8 into the environment. The same day Dr. Emmett presented the results of the first round of blood testing of community members, it was announced that free bottled water was being made available to those in the affected area. If memory serves, nearly three-quarters of the affected population signed up for the free water. Dr. Emmett recommended the use of an alternative source of water until the Little Hocking Water system was free of C8.

The community was engaged over the entire course of the study.

- The Decatur Community Association was engaged in a meaningful way at the outset of the study.
- A Community Advisory Committee was established with representatives from all important stakeholder groups extended invitations to join.
- The Community Advisory Committee met regularly and made meaningful suggestions over the course of the study. Dr. Emmett was present at each meeting, reporting on study progress, answering questions, and listening to the concerns and advice of the membership.
- A public meeting was held to release study results; at this meeting, Dr. Emmett responded carefully to questions for, if memory serves, nearly two hours.

Collaborative problem solving was stressed.

As mentioned above, the study featured collaborative problem solving through the Community Advisory Committee. Meeting quarterly throughout the study and working through an agenda prepared in advance by Dr. Emmett and myself, issues related to logistics of sampling of the affected population, the best means of releasing study results to the community, and other related matters were discussed and solutions determined.

I believe the Community C8 Study is a strong example of the power and potential of community-campus partnerships as a strategy for social justice.



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To Whom It May Concern:

It is my privilege to support the nomination of the Decatur Community Association of Washington County Ohio for the Community-Campus Partnerships in Health Award. After years of exposure to C8 from the Dupont plant located in West Virginia, western Washington County residents were made aware of the potential health hazards associated with contamination by C8 in air and drinking water.

Several studies were court ordered, but it became evident that there was a need for an independent study that really looked at some of the issues not being addressed. Dr. Edward Emmett pursued grant funds to conduct such a study. In order to begin this study, he needed the help of a community partner. The Decatur Community Association stepped forward to organize the appropriate organizations and individuals within the county to be part of this study committee. Representatives from the Association organized meetings, developed a community newsletter, and maintain a website to inform the public of the nature of the study, community involvement, and results obtained.

Without the support of the Association, I do not believe the study would have achieved its successful completion.

Thank you for the opportunity to support this nomination.

Sincerely,

Kathleen L. Meckstroth, DrPH
Health Commissioner



1436 U Street NW, Suite 100
Washington, DC 20009
T: 202.667.6982
F: 202.232.2592

February 10, 2008

To: Community-Campus Partnerships for Health Award Review Committee

I am writing to express enthusiastic support for the nomination of Dr. Edward Emmett's work for the Community-Campus Partnerships for Health (CCPH) Annual Award. This study focused on the Little Hocking, OH community exposure to perfluorinated chemical C8 (perfluorooctanoate or PFOA). Public drinking water supplies in Little Hocking have been contaminated for many years with PFOA released by the Washington Works fluoropolymer production facility. The team of researchers led by Dr. Emmett helped the community to find social and environmental justice, obtain a clean water supply, and move towards reduction of PFOA health hazard to Little Hocking residents.

This exemplary study was founded on an innovative "Community First" approach that emphasizes collaborative partnership between academic researchers and members of the community. As the key and integral part of this approach, the findings of the study were first released to the community participants rather than waiting for the official publication.

The demonstrable successes of the study include:

- a) Following the completion of this study, the Washington Works plant began offering bottled water to all residents serviced in the Little Hocking Water district within days of the October 2005 community meeting where study results were presented. At least 90% of the people in the community changed their source of drinking water.
- b) With the access to PFOA-free drinking water, PFOA levels in blood of Little Hocking have now decreased by 26%.

The Little Hocking community, earlier experiencing a sense of social injustice and disempowerment from their long-term exposure to C8 in drinking water, responded in a positive and proactive way to this public health protection study. The university group successfully involved the public in working to preserve the health of the community, as evidenced by the high participation rates in the original epidemiological research, transition to new water supply and follow up health monitoring studies. In helping to bring about lower PFOA blood levels, this project made a lasting and positive difference in the community.

Finally, strong and effective collaborations have been established between the investigators with their community partners Grand Central Family Medicine in Parkersburg, West Virginia, and the Decatur Community Association in Cutler, Ohio. These integrated relationships between academia, Little Hocking residents, and local physicians have been instrumental in designing the study, recruiting local study participants, collecting data, and disseminating the data back to the community.

In summary, I am very happy to see the outstanding work from Dr. Edward Emmett and the University of Pennsylvania Center of Excellence in Environmental Toxicology (CEET) team nominated for the Community-Campus Partnerships for Health Award. I look forward to the ongoing work of the CEET group on this important project.

Sincerely,

Olga V. Naidenko, PhD
Senior Scientist
Environmental Working Group

Partnership Agreement: Plan to Institute Collaborative Research Partnership

The Partners

1) *Environmental Research Scientist: Edward Emmett, MD, MS. University Of Pennsylvania School of Medicine*

The University of Pennsylvania, School is a major research institution. The University with the associated Medical Center is currently ranked second in the nation in NIH research funding. Dr Edward Emmett, the Principal Investigator is a Professor and full-time faculty member in the School of Medicine, and is Director of Academic Programs in Occupational Medicine, a Senior Fellow in the Center for Epidemiology and Biostatistics, and is on the Executive Committee of the university-wide Institute for Environmental Studies. Dr Emmett is a senior researcher with over 30 years experience in environmental and occupational health research. He has board certification in Occupational Medicine and in Toxicology. He has conducted numerous research studies in Environmental and Occupational Medicine and is expert in biomonitoring, toxicology, in studies linking environmental exposure with human health.

Dr. Emmett has substantial experience and skills with community and consortium activities. Among many other appointments he has been Chair of the Governors Council on Toxic Substances for the State of Maryland, Chair of the State of Maryland Hazardous and Toxic Substances Commission, Vice-chair of the City of Cincinnati Environmental Advisory Council, and a member of the Citizen Scientist Committee on Drinking Water Quality for Cincinnati. He has been principal investigator for a number of environmental health studies in urban and rural communities. Dr Emmett is experienced in risk communication to lay audiences concerning chemical hazards. He currently serves as the Risk Communicator for the United Auto Workers Union(UAW) and General Motors, and for UAW-Delphi Corporation, in which role he develops communications for workers and plant management about results of occupational research sponsored by the UAW and these companies.

2) *Local Health Practitioner: Hong Zhang, MD, MPH, HealthSouth Rehabilitation Hospital Parkersburg*

Dr. Hong Zhang has been a primary health care provider in the Parkersburg Marietta area of Ohio and West Virginia for seven years. Dr Zhang is currently a one of three full time physicians at the Health South Hospital in Parkersburg ,WV. Her practice is almost entirely an ambulatory care primary care practice. The Hospital's patient catchment area includes the LHWAD. Dr Zhang has post-graduate training in Internal Medicine, Preventive Medicine and Occupational Medicine.

3) *Community Organization: Robert Griffin, P.E., Little Hocking Water Association*

The Little Hocking Water Association, Inc. (LHWA) is a non-profit corporation formed in 1968 to provide potable water service to rural Washington County, Ohio, and currently provides water service to approximately 12,000 people in western Washington County, and parts of eastern Athens County. The LHWA operates under a license from the Ohio Environmental Protection Agency, which is the state regulatory authority for water systems in Ohio.

Mr. Robert Griffin, who is a registered civil engineer, has been the General Manager of the LHWA , since 1989. Prior to coming to LHWA, he was employed as a project manager

with a local engineering firm for over 12 years. He is also an instructor with the Operator Training Committee of Ohio, which provides technical training to water and wastewater personnel in Ohio and other states.

Mr. Griffin is thoroughly experienced with the history of the C-8 problem, as it has unfolded and affected the Little Hocking Water Association. He has communicated with the LHWA customers through mailings, news releases, website postings, and public meetings. He is very familiar with the local community and its leaders, and has worked closely with representatives of the Ohio Environmental Protection Agency.

Roles of the Partners

Dr. Edward A. Emmett, MD, Principal Investigator,

- Responsible for overall conduct of the project.
- Responsible for ensuring effective participation and collaboration amongst the three study core personnel groups.
- Responsible for scientific study design, analysis of results and scientific conclusions.
- Responsible for liaison with federal government agencies
- Responsible for coordination and supervision of input of environmental consultants.
- Responsible for evaluation phase.

Dr. Hong Zhang, will be responsible for local medical and health aspects of this study including

- questionnaire administration and specimen collection for C8 analysis.
- developing interpretation of results of analysis and informing study participants of results.
- with Dr. Edward Emmett for developing educational materials for community members and health care practitioners.
- information, education, and liason with health care providers
- developing community education materials.

Robert Griffin, PE

- Responsible for coordination of community stakeholder input.
- Responsible for two-way communication with community
- Responsible for dissemination of progress reports, and aggregate study results to community
- Responsible for environmental education efforts, quarterly newsletter and maintaining website for community information and education.
- Responsible for convening meetings of the Community Advisory Committee
- Responsible for maintaining inventory of regulatory and voluntary community actions to reduce C8 exposure
- Responsible for liason with local and state government agencies and authorities

The three key members of the partnership have already been working together informally on C8-related issues. A full-day meeting was held at Little Hocking on December 9, 2002, attended by Drs. Emmett and Zhang, Mr. Griffin, board members of the LHWA and community opinion leaders, to discuss C8 issues and develop this proposal.

The following are a selection of quotes from Callie Lyons' book, Stain-Resistant, Nonstick, Waterproof, and Lethal: The Hidden Dangers of C8, which has chronicled the timeline of events surrounding the C8 story:

“Most important to residents, the research resulted in the first, and for many years only, list of recommendations from an independent science perspective on how to avoid or minimize the potential risk of harm from C8 exposure.” (p. 99)

“It was Emmett’s research that first revealed conclusively that some of the people who lived in the Little Hocking area were more contaminated than many of DuPont’s own plant workers.”
(p. 99)

“In preparation for the study, Dr. Emmett established a community advisory committee, which included one representative from each of the seven townships and various public and health officials (including health department administrators, school officials, and physicians), along with representatives from the EPA and OEPA. Their purpose was to help guide the process of recruitment and the distribution of information throughout the community.” (p.100)

“He began the project in April 2004, and revealing his compassion for people and the steadfastness of his character, he returned to the Mid Ohio Valley in August 2005 to release the results in a rural high school auditorium as soon as he possibly could (which mightily inconvenienced the droves of industry, legal, government, and media people who had to travel to be there for the major announcement.) Emmett even went so far as to make time for one-on-one sessions and follow-up questions with individual study participants, publicly announcing his availability at a remote community building for several hours the following day.” (p.101)

“His approach worked because of Emmett’s compassion and because of his personal philosophy.” (p.102)

“Although the Little Hocking Water Association had been trying for years to get an alternative source of drinking water for his customers, Emmett’s study was the impetus for DuPont to implement a bottled water program. The corporation immediately began reimbursing customers for purchases of bottled water and within thirty days it had established a home delivery program.” (p.108)

“Yet Emmett’s simple research, based on a few straightforward questions about C8, provided a wealth of information to science and the community. Ultimately, Emmett’s study paved the way for a closer evaluation of the chemical’s presence in both soil and food. And most important for residents of the Mid Ohio Valley, it resulted in sound advice and clean drinking water supplies for the people of Little Hocking.” (p.108)

Publications

Emmett EA, Shofer FS, Zhang H, Freeman D, Desai C, Shaw LM. Community exposure to perfluorooctanoate: relationships between serum concentrations and exposure sources. *J. Occup. Environ. Med.* (2006a) 48:759–770.

Emmett EA, Zhang H, Shofer FS, Freeman D, Rodway NV, Desai C, Shaw LM. Community exposure to perfluorooctanoate: relationships between serum levels and certain health parameters. *J. Occup. Environ. Med.* (2006b) 48:771–9.

EPA Poster Award

Abstract and Poster presentation EPA Science Forum 2006 Community exposure to perfluorooctanoate: sources of exposure and health effects. Awarded first place prize (of over 220 presentations) Format: Abstract, poster Date: May 2006

Selected Presentations

Various Presentations to Graduate & Undergraduate classes at the University of Pennsylvania.

Emmett, E.A. Studies of Community Exposure to Perfluorooctanoate. Future Lecture. University of Cincinnati, Cincinnati, OH, April 2008.

Emmett, E.A. Perfluorooctanoate (PFOA) from Teflon Manufacture: Community Exposure, Potential Risks and Effects of Intervention. Invited Lecture, CCEB Seminar, University of Pennsylvania School of Medicine, Philadelphia PA. January 2008.

Emmett, E.A. Perfluorooctanoate Exposure and Effects. Chalk Talk Series, Center of Excellence in Environmental Toxicology. December 20, 2007

Rodway, N. Successful Reduction of Community Exposure to Perfluorooctanoate through an Environmental Justice Partnership. Invited Lecture, American Public Health Association Conference, Washington DC. November 2007.

Emmett, E.A. Success of “Community First” Risk Communication: Model in PFOA Exposure. Invited Lecture, Philadelphia Occupational and Environmental Medical Society. September 19th, 2007.

Emmett, E.A. Empowerment through Reversing Information Disparities: Successful Reduction of Community Chemical Exposure through and Environmental Justice Partnership. Invited Lecture, Howard University Environmental Justice Conference, Washington DC. March 29th, 2007. [Paper is available online].

Emmett, E.A. Community Exposure to Perfluorooctanoate: A Successful Model for Risk Communication in CBPR Studies. Invited Lecture, Environmental Justice & Community-based Participatory Research Annual Grantee Meeting, Research Triangle Park, NC, October 2006.

Emmett, E.A. & Rodway, N. Invited Lecture, Studies of Community Exposure to Perfluorooctanoate. Ohio Public Health Epidemiology Conference, Columbus OH. August 1, 2006.

Emmett, E.A. Community Exposure to Perfluorooctanoate. Invited Presentation EPA 2006 Science Forum, Washington DC, May 16 2006.

Emmett, E.A. Community Exposure to Perfluorooctanoate, Invited Lecture, American Occupational Health Conference, Los Angeles CA, May 8, 2006.

Emmett, E.A. Community Exposure to Perfluorooctanoate: Sources of Exposure and Health Effects. Invited Lecture. American College of Occupational & Environmental Medicine. Annual Meeting, Los Angeles, May 2006.

Emmett, E.A. Community Exposure to Perfluorooctanoate, Epidemiology Seminar Series, Center for Clinical Epidemiology and Biostatistics, University of Pennsylvania, Philadelphia, PA, June 30, 2005.

Emmett, E.A.: Community Exposure to Perfluorooctanoate. Institute of Environmental Studies, University of Pennsylvania, February 23, 2005.

Press Releases

Lyons, Callie. "DuPont to provide alternate drinking water to 12,000." [Athens Messenger](#). 16 August 2005.

Lyons, Callie. "University of Pennsylvania C8 Study Recommendations Presented to Little Hocking Consumers." [Marietta Online](#) 16 August 2005.

Ward Jr., Ken. "Avoid C8 Water, researcher says." [The Charleston Gazette](#). 16 August 2005.

York, Kate. "Group to Give Results of C8 Study." [The Marietta Times](#) 13 August 2005.

Griffin, Robert. "DuPont Agrees to Finance Bottled Water Program for LHWA Service Area." [Little Hocking Water Association](#) Press Release. 15 August 2005.

Harmon, Rebecca. "Penn Study Finds Significantly Elevated C8 Levels Among Studied Population Group in Southeastern Ohio: Water is Identified as the Major Source of Contamination." [University of Pennsylvania](#). Press Release. 27 July 2005

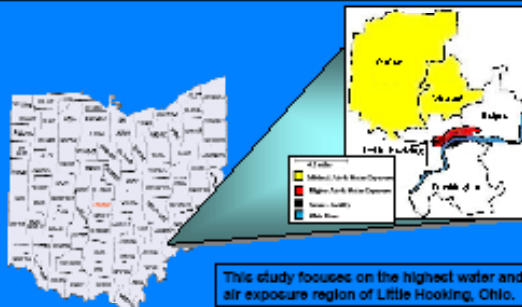
Community Exposure to Perfluorooctanoate: Sources of Exposure and Health Effects

Edward Emmett, Leslie Shaw, Chintan Desai, and Frances Shofer, University of Pennsylvania School of Medicine Hong Zhang, Grand Central Family Medicine, David Freeman, Decatur Community Association, Nancy Rodway, Adena Occupational Health
Supported by a grant to an Environmental Justice Partnership

Background

Perfluorooctanoate (PFOA) is used in the production of many common fluoropolymers, including non-stick cookware and all-weather clothing. PFOA is persistent in the environment and the human body, and not biodegradable. PFOA is a known animal carcinogen, causing liver toxicity and developmental delays in animals. PFOA toxicity to humans remains unclear. Low levels of PFOA are now ubiquitous in human serum and biota, worldwide.

"At present, there are no steps EPA recommends... to reduce exposure... because the sources of PFOA in the environment and the pathways by which people are exposed are unknown. Whether human exposures are due to... air, the water, dust, sediments, dietary sources or... some combination is unknown" - EPA 2005



This study focuses on the highest water and air exposure region of Little Hooking, Ohio.

Objectives

- To determine the levels of C8 in the blood of residents in the Little Hooking water service area and to compare these with levels in other populations.
- To determine the major sources of exposure (water, air, other) influencing the blood C8 levels.
- To determine whether there is an association between blood C8 levels and markers of health effects.
- To address intense community concerns through an independent community based study

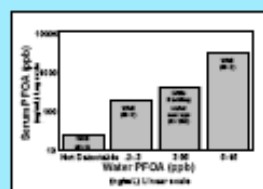
Methods

Questionnaires were administered and blood samples were taken from a stratified random sample of residents & additional volunteers from the Little Hooking water service district. Blood serum [PFOA] was measured by HPLC/tandem MS and we measured various blood biomarkers of possible toxic effects.

Results

1. The PFOA levels in the blood serum of the residents of Little Hooking, Ohio are comparatively very high:

| Exposure | PFOA in serum (ppb) |
|---|---------------------|
| Median PFOA in general US population | 5 |
| Median PFOA in Little Hooking water users | 374 |
| Median PFOA in Little Hooking water users who worked in production using PFOA | 775 |

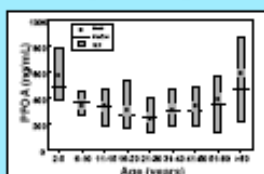


2. The primary source for serum PFOA is the Little Hooking water supply. Air exposure had no noticeable effect.

The highest PFOA serum levels were found in those residents who used Little Hooking water exclusively.

| Drinking Water Source | N | PFOA serum (ppb) |
|---|-----|------------------|
| Little Hooking water system water only | 281 | 374 |
| Little Hooking plus bottled or spring | 20 | 320 |
| Bottled and/or clean and/or spring water only | 10 | 71 |
| Residential well water & well & other (* very variable) | 20 | 75* |

3. For those residents whose primary water source is the Little Hooking water supply, levels of serum PFOA are significantly influenced by the following variables:



→ **Age:**
Higher serum PFOA in vulnerable age groups: under 5 years and over 60 years

→ **Intake of homegrown fruits and vegetables:**
Higher PFOA serum content in frequent homegrown consumption; may be due to cleaning, cooking, canning processes

→ **Number of tap water drinks per day:**
Higher PFOA serum content with more frequent tap water consumption

→ **Use of carbon filter for tap water:**
Modest lowering of PFOA serum content with use of carbon filter; not as effective as bottled water substitution

4. No relationship was observed between PFOA levels and the health indicators considered-

History of liver & thyroid disease

Biomarkers of liver, kidney, thyroid, function

NOW THAT PATHWAYS ARE IDENTIFIED, STEPS CAN BE TAKEN TO REDUCE EXPOSURE.

Recommendations

- Expediently institute treatment to remove PFOA from Little Hooking system water, monitor continuing efficacy of treatment
- Ensure reduced PFOA emissions
- If you desire to reduce your PFOA exposure, consider an alternate water source whenever water may be ingested
- Revisit the West Virginia so-called "safe level" of PFOA in water in light of new information

Community Impacts

- Almost immediately following the release of our findings, residents in the Little Hooking water district were provided with the option of up to three liters of bottled water daily, courtesy of the fluoropolymer production company
- As of January 2008, ~70% of Little Hooking residents took advantage of this offer
- A new water treatment facility is being built
- An improvement in community trust; some community members say "the edge has now been taken off the issue"



Looking to the Future

- We are undertaking:
 - A follow-up study to test changes in PFOA levels with treated water sources; & explore PFOA half-life in the human body
 - Studies to address the role of fruits and vegetables in PFOA exposure
 - Studies addressing cancer risk and childhood development
 - Continuing to answer the public's questions about PFOA

This work was supported by NIEHS grant number 1R25ES012519



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BEYOND THE BENCH

Research Helps Clean Up A Water Supply

Many of the conveniences of modern life are made possible with man-made compounds. One such chemical, perfluorooctanoic acid (PFOA), has a broad spectrum of use, from the manufacture of non-stick cookware to aerospace technology. PFOA's persistence in the environment is troubling, especially given studies demonstrating that exposure to the compound can cause developmental delays and cancer in lab animals. Thus, when PFOA was detected in the water supply of Little Hocking, a village located across the Ohio River from and downwind of a Washington, West Virginia, fluoropolymer manufacturing facility, researchers at the University of Pennsylvania NIEHS Center of Excellence in Environmental Toxicology (CEET) felt compelled to investigate. The contamination was first reported to Hong Zhang, a local doctor enrolled in a practicum residency for physicians in occupational and environmental medicine at the university.

According to CEET deputy director Edward Emmett, who also directs the center's Community Outreach and Education Core, the research team's immediate focus was on determining whether, how, and to what extent Little Hocking residents were being exposed to PFOA. The CEET investigators joined with community partners Grand Central Family Medicine in Parkersburg, West Virginia, and the Decatur Community Association in Cutler, Ohio, to design a study, recruit study participants, and collect data. The group applied for and received an environmental justice grant from the NIEHS, and began work in July 2004.

The investigators distributed questionnaires to a random sampling of residents who used either private or public drinking water sources, and examined blood serum samples to assess PFOA concentrations. PFOA water concentrations were obtained from the Ohio EPA. Levels averaged 3.55 ng/mL in 2002–2005, some of the highest ever reported in public water supplies in the United States.

Overall, blood serum analysis showed that the residents' levels were 60–75 times higher than in the general U.S. population. The investigators found that serum PFOA was especially high in those who ate more home-grown fruits and vegetables. Emmett says it is unclear if this was due to PFOA



Town meeting. Edward Emmett presents results of the CEET's findings to the Little Hocking community.

making its way into the fruits and vegetables themselves, or to PFOA in water used for cooking, canning, and cleaning.

An air dispersion model based on estimated emissions from the Washington plant revealed that serum PFOA levels were no different for those people living in areas with higher air concentrations than for those living where there was minimal PFOA in the air. Regardless of location, higher concentrations were found in young children and older adults, as well as in people who worked directly with PFOA in production areas of the Washington plant (all three groups' serum levels were almost twice as high as other residents accessing the Little Hocking water supply).

The research team examined all blood samples for biomarkers indicating DNA damage, but found no sign of adverse health effects. However, given what is known about the chemical's effects in lab animals, Emmett says that lowering the Little Hocking residents' exposure was prudent, and the independent research conducted by the partnership helped empower the community to secure a cleaner drinking water supply. "What has been so compelling and gratifying about this work has been witnessing how powerful credible, nonbiased information collected without conflict of interest can be in altering peoples' behavior voluntarily," says Emmett.

The Washington plant began offering bottled water to all residents being serviced

in the Little Hocking Water District within days of an October 2005 community meeting where study results were presented. Other findings from the study suggested that carbon filters in the home could help to remove some PFOA from the water. Still, these were not considered viable long-term solutions, so a new filtration facility is being created to remove all PFOA from the water supply. The facility should be functioning in a few months.

Emmett says it is also gratifying to know that the partnership's research has had a positive impact on the community. One resident remarked, "There was a large fine from EPA. There was a lawsuit, and a lot of money changed hands. But it's [the CEET] study that has changed the water I drink."

The study, which won first prize in the May 2006 EPA Science Forum, was described in two articles in the August 2006 *Journal of Occupational and Environmental Medicine*. A follow-up study is now under way to measure community members' current PFOA blood levels. More information is available at <http://lhwc8study.org/>.

—Tanya Tillett