Winter 2007

Your Health & The Environment

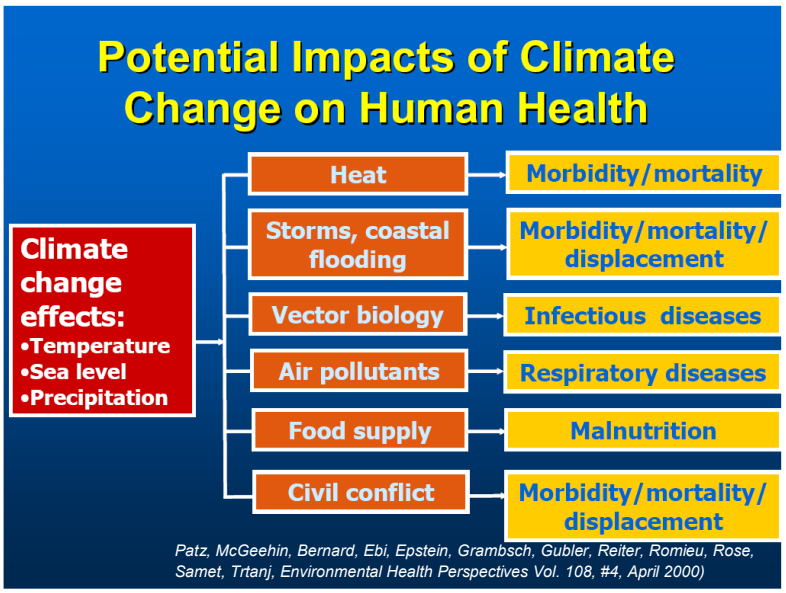
News from the University of Rochester Environmental Health Sciences Center (EHSC)

www2.envmed.rochester.edu/envmed/ehsc/outreach/COEPpubs/COEPpub.html

In this Issue:

Climate Change and Environmental Health

With increasing public concern about global climate change, public health professionals and researchers are focusing on the implications for human health. Research suggests that environmental effects of climate change such as heat stress, air pollutants, and changes in food and water supplies will directly and indirectly impact human health. Effects of climate change will disproportionately impact vulnerable populations like the poor, young, and elderly.



As Dr. Julie Gerberding, Director of the Center for Disease Control stated: "… we anticipate that as climate changes, there will be health consequences. It's impossible to believe there won't be, whether it's more natural disasters or a change in the pattern of them or whether it's vectors, mosquitoes that move to new habitats and diseases like malaria or West Nile or whether it's heat stroke and direct complications of heat. We believe there are unpredictable health consequences that will occur and our job is to anticipate what they might be, to make sure that we have systems in place that can detect them, and, most importantly, that we take steps now to be able to help mitigate whatever those harms are. " (*Testimony before the House Appropriations Committee, Subcommittee on Interior, Environment and Related Agencies, Hearing on Fiscal Year 2008Appropriations: Interior and Environment, March 2, 2007*)

In November 2007, EHSC Outreach Coordinator Katrina Korfmacher, Ph.D. and Program Manager Kate Kuholski attended the American Public Health Association's annual meeting in Washington, DC, where multiple sessions addressed the impacts of climate change on human health. Speakers addressed both the need for "mitigation" (reducing emissions of pollutants that contribute to the greenhouse effect) and "adaptation" (anticipating and responding to changes resulting from rising temperatures). They emphasized that many mitigation strategies have multiple benefits. For example, promoting energy efficiency both reduces fossil fuel consumption and particulate pollution, which benefits human health. Similarly, making cities more pedestrian- and bike-friendly combats both global warming and obesity. At the same time, the presentations emphasized the wide range of health impacts, ranging from the direct effects of increased storm intensity to the indirect impacts of the northward spread of malaria. A central theme was that human health impacts are not sufficiently recognized in the current policy debates about preventing and responding to climate change. Because of such concerns, the American Public Health Association's Environment Section has made climate change one of their top policy issues and has selected climate change as the theme of the next Public Health week (April 7-13, 2008; see www.apha.org).

This newsletter is supported by grant # ES01247 from National Institutes of Health NIEHS National Institute of Environmental Health Sciences ~ Your Environment is Your Health ~

Integrated Health Sciences Facility Core

Thanks and goodbye!

We are sad to report the departure of **Dr. Bill Beckett** after 11 years as director of the Finger Lakes Occupational Health clinic and a member of the Environmental Health Sciences Center. Dr. Beckett has been a key contributor to the COEC through advising individuals and groups on a wide range of environmental exposures. Dr. Beckett will be joining the staff of Mt. Auburn hospital in Cambridge, MA as of December, 2007. We thank him for his strong and ongoing support of our outreach and education efforts and wish him well in his new position.

Clinical and Translational Science Institute's Synergy with Environmental Medicine's Integrative Health Sciences Facility Core

William S. Beckett, M.D., M.P.H.,
Professor of Medicine and Environmental Medicine

Emphasis on developing clinical and translational research to improve the nation's health is occurring at many levels of the academic research enterprise. The University of Rochester Clinical and Translational Science Institute (CTSI) is one of 12 institutions nationwide with funding from the National Institutes of Health to lead the emerging field of clinical and translational research. The CTSI is building the foundation to assist researchers at the University of Rochester and across Upstate New York to produce innovative technology and methods that more efficiently and more quickly advance treatments to patients.

Almost simultaneously with the opening of University of Rochester's CTSI came a new initiative for the University's 35 year old Environmental Health Sciences Center, supported by the National Institute of Environmental Health Sciences (NIEHS). The NIEHS now requires its Centers to have an Integrated Health Sciences Facility Core to facilitate clinical and translational research by environmental health researchers.

Once an institute focused on animal and systems toxicology testing, the NIEHS took a dramatic turn toward patient oriented research, shifting emphasis from known toxins to the chronic diseases they may contribute to. Clinical investigators in Environmental Medicine have long utilized the University's Clinical Research Center for patient-oriented research. The impetus to assist our basic scientists in moving their work closer to the bedside and the community suggested a natural synergy with CTSI.

How do these two large research enterprises within the same institution join forces to achieve their mutual goals? As is usual in science, information is often the starting point. Recognizing natural areas of common interest between investigators who have not previously collaborated requires awareness of opportunities outside ones own department, sometimes outside one's own institution. With assistance from EHSC Project Manager, Kate Kuholski, a database of our own clinical research resources will be merged with that of CTSI and made available institution wide, with hopes to spark collaborations.

The next step, helping to establish durable and longstanding research collaborations, will require more than one approach. A huge strength of our institution, the daily care of thousands of patients per year with common chronic diseases, can-- with appropriate preparation and human subject consent-- make possible the analysis of patient-derived cell lines, proteins, and genes. The EHSC's Integrative Health Sciences Facility Core also plans to bring in investigators who have already succeeded to discuss their methods, and to develop a database of investigators in other NIEHS centers nationwide who may want to collaborate on specific proposals.

For more information, check out:
http://www.urmc.rochester.edu/ctsi/

Integrated Health Sciences Facility Core

Impact of Environmental Particulate Matter on Human Health and Innate Immunity

Marc A. Williams, Ph.D., Assistant Professor of Medicine and of Environmental Medicine.
For more information contact: marc_williams@urmc.rochester.edu

Particle pollution, often referred to as particulate matter (PM), is a combination of fine solids and aerosols that are suspended in the air that all of us inhale. PM is particularly hazardous because the particles vary in aerodynamic diameter, meaning that some particles are small enough to deposit deep in the lungs where they can impart serious damage. The largest types of PM of concern are 10 microns in diameter (PM_{10}). The group of most concern, however, is 2.5 microns in diameter or smaller ($PM_{2.5}$). Some of these are thought to be small enough to exit the lung and directly enter to the bloodstream just like oxygen molecules. Particulate matter is extremely hazardous to health. Even brief exposure (hours to days) to particle pollution may cause deaths in susceptible individuals due to respiratory and cardiovascular causes, including strokes; heart attacks (especially among the elderly and in people with heart conditions); inflammation of lung tissue in young, healthy adults; increased hospitalization for cardiovascular disease; increased emergency room visits for patients suffering from acute respiratory diseases as well as increased severity from or hospitalization for asthma in children. Year-round exposure to PM has been linked to increased hospitalization for asthma attacks in children; retarded lung function development and significant damage to the small airways of the lungs; increased risk of dying from lung cancer and increased risk of death from cardiovascular disease. Our recent publications have provided important and novel insights into how particulate pollution drives an unusual pattern of dendritic cell development and function that may be responsible, at least in part, for the allergic inflammatory response seen in asthma.

My group includes two highly talented research scientists; Dr Smruti Killedar (an Instructor in Medicine) and Dr Stephen Bauer (an NIH Post-Doctoral Research Fellow). The major focus of our current research is to understand the mechanisms whereby the immune system responds to and is adversely affected by inhaled particulates in the air we breathe. These inhaled particles include atmospheric particulate "soot," diesel exhaust particles and atmospheric allergens such as ragweed or birch pollen and even breakdown products of cockroaches and of course dust mites and so on.

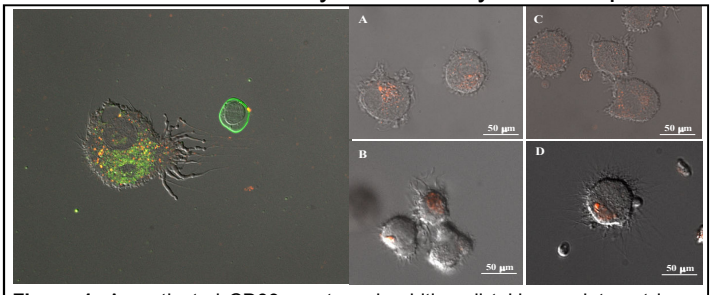


Figure 1: An activated CD83+ mature dendritic cell taking an interest in a CD4+ helper T cell (left hand panel). When DC encounter particulate matter, they become activated and interact with naïve CD4+ T cells in a way that stimulates production of cytokines that may provoke an allergic inflammatory reaction (e.g. high levels of IL-5 and IL-13) and exacerbations of asthma. [For more information, see: Williams MA, et al, Ambient Baltimore Particulate Matter Directs Non-Classical Immune Activation of Human Myeloid Dendritic Cells. *Journal of Allergy and Clinical Immunology* 119:488-497, 2007]. In addition, expression of Toll-Like Receptor 2 (TLR2) and TLR4 following stimulation of DC with PM is shown (right hand panels). Images A and B show TLR2 and images C and D are TLR4 without/with PM stimulation. We have comprehensively studied how particulate pollution drives an unusual pattern of dendritic cell development and function that may be responsible for the Th2-type allergic inflammatory phenotype seen in asthma. [For more information see: Williams MA, et al. TLR2 and TLR4 as potential biomarkers of environmental particulate matter exposed human myeloid dendritic cells. *Biomarker Insights* 2: 225-239, 2007; Porter M, et al. Diesel exhaust particles induce a novel pattern of pro-allergic dendritic cell activation. *American Journal of Respiratory Cell and Molecular Biology* E-pub Ahead of Print, July 13th 2007].

The focus of my research is to understand how inhaled particles contribute to allergic asthma and enable cells in the immune system to promote all the hallmarks of an allergic asthmatic attack such as wheezing, difficulty in breathing and, we believe, a subsequent increased susceptibility to infectious diseases of the lung. A specialized population of cells called dendritic cells (DC) are by far the most enigmatic and highly specialized of all cells in the immune system responsible for protecting us from infections (Figures 1, 2). However, despite their importance in providing protection from bacterial or viral infections, we believe dendritic cells are capable of unknowingly exacerbating asthma on encountering inhaled particulate pollutants and subsequently predisposing susceptible individuals to infections of the lung. We have initiated a laboratory-based clinical study of the immune responses of immune cells obtained from allergic asthmatic subjects as compared with non-allergic asthmatic subjects to see how they differ in their responses to particulate pollutants as compared with normal healthy individuals. In this way we hope to be able to identify possible novel therapeutic targeting of allergic asthma that may improve current management of this potentially debilitating and increasingly prevalent condition.

EHSC Pilot Project Program

Brain Cancer and Bone Lead Levels

Edwin Van Wijngaarden, Ph.D., Assistant Professor of Community and Preventative Medicine
For more information contact: Edwin_van_Wijngaarden@urmc.rochester.edu

The cause of brain cancer remains largely unknown. It is believed that exposure to environmental agents plays an important role in the development of this disease, although no definite links for specific chemicals have been established. The epidemiological literature on lead exposure and brain cancer is inconclusive.

However, this literature has been plagued with methodological limitations which limit the ability to detect an association, and several recent studies have provided evidence warranting a closer look at this question using more sophisticated methods. Additional suggestive evidence comes from studies reporting the development of brain tumors in rats after ingestion of lead salts. In 2004, the International Agency for Research on Cancer (IARC) classified inorganic lead compounds as probably carcinogenic to humans (Group 2A) based on sufficient evidence from animal studies and limited epidemiologic evidence."

In a pilot study funded by the Environmental Health Sciences Pilot Project Program, 19 patients with brain tumors (5 with meningioma, 14 with glioblastoma) have been recruited to measure bone lead levels and inquire about residential, occupational an medical histories, among others. Participating patients ranged between the ages of 27 and 88. Bone lead was measured at the tibia and calcaneus to estimate exposure to lead in different time periods of the patients' lives. The sessions took on average about 1 hour to complete, and were well tolerated by the patients in our study. The average bone lead level in our population is about 10 ìg per gram of bone mineral and generally did not exceed 30 ìg/g bone mineral. These levels are below the median levels reported in the Normative Aging Study and do not indicate that bone lead levels are excessive in our population of brain tumor patients. The median bone lead level in the Normative Aging Study (PI: Dr. Howard Hu) is between 18 and 43 ug per g bone mineral depending on the age group (ranging from 40-90+).

We will continue to recruit patients and analyze bone lead levels in the context of the participants' factors such as age, gender, and occupational and residential history. Lessons learned on the logistical challenges of conducting a hospital-based epidemiological study will provide guidance to the conduct of future, similar studies. Furthermore, this study is the first to measure bone lead levels in brain tumor patients. Therefore, we will seek to publish our preliminary findings in a peer-reviewed journal which will add valuable information to existing literature.

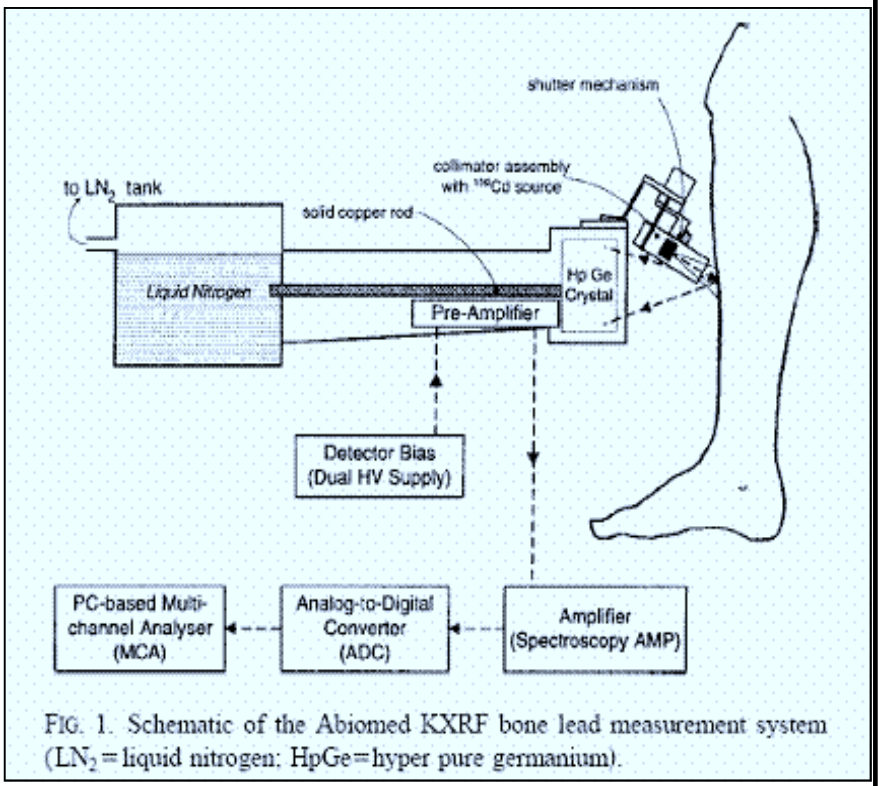


FIG. 1. Schematic of the Abiomed KXRF bone lead measurement system (LN_2 = liquid nitrogen; HpGe = hyper pure germanium).

Community Outreach & Education Core (COEC)

Rochester's Healthy Home

Regional Community Asthma Network's Beth Schlabach talking with Dr. Phillip Landrigan at Rochester's Healthy Home

The Healthy Home has been a busy place this year! A "Year One Pilot Project Report'' and "Guide to Replication" were created and distributed. In November, Katrina Korfmacher, PhD presented at the American Public Health Association's national conference in Washington, DC on "Promoting Environmental Health Policies Through a Model Healthy Home."

As of December 2007, over 1300 people have visited the Healthy Home. Recent notable guests include Roy A. Bernardi, Deputy Secretary, US Department of Housing and Urban Development and Dr. Phillip Landrigan of Mt. Sinai's Medical Center's Children's Environmental Health Center. Dr. Landrigan's visit to Rochester included presenting at grand rounds for the Department of Pediatrics and meeting with members of Rochester's Children's Environmental Health Center. Also, Dr. Landrigan gave a public talk on November 13 at the Breast Cancer Coalition on "Raising Healthy Children in a Toxic World: What Parents Can Do to Protect Their Children." The COEC is working with Rochester's Children's Environmental Health Center in order to develop a resource guide and database of the local organizations and programs which provide significant resources related to children's environmental health and will be provided to health care providers, home health care visitors, and other professionals. The Healthy Home is free and open for tours by groups or individuals. For more information contact healthyhomerochester@gmail.com or visit http://www2.envmed.rochester.edu/envmed/ehsc/outreach/CommunityPartners/CommunityPartnersHH.html

New York State Health Foundation funds University of Rochester to address childhood lead poisoning in three upstate communities

The Community Outreach and Education Core (COEC) of the Environmental Health Sciences Center has been awarded a one-year grant of $139,753 from the New York State Health Foundation to support development of lead poisoning prevention coalitions in three upstate cities. The COEC will work with the Rochester-based Coalition to Prevent Lead Poisoning (CPLP) as well as three local non-profit community groups in Elmira, Utica, and Auburn. The lessons learned through the COEC's seven-year partnership with the CPLP will be used to support community involvement in lead coalitions in each of the three partner cities.

Toxicology Training Program

Welcome to the entering students, Fall 2007!

Joshua Allen, *Ashland University, B.S. 2007*

Tha Thach, *University of Wisconsin/Madison, B.S. 2006*

Whitney Christian, *Davidson College, B.S. 2001*

Joseph Frasca, *Ithaca College, B.A. 2005*

Casey Manning, *Central Michigan University, B.S. 2006*

Melissa Badding, *Rochester Institute of Technology, B.S. 2007*

Winter 2007

Your Health & The Environment

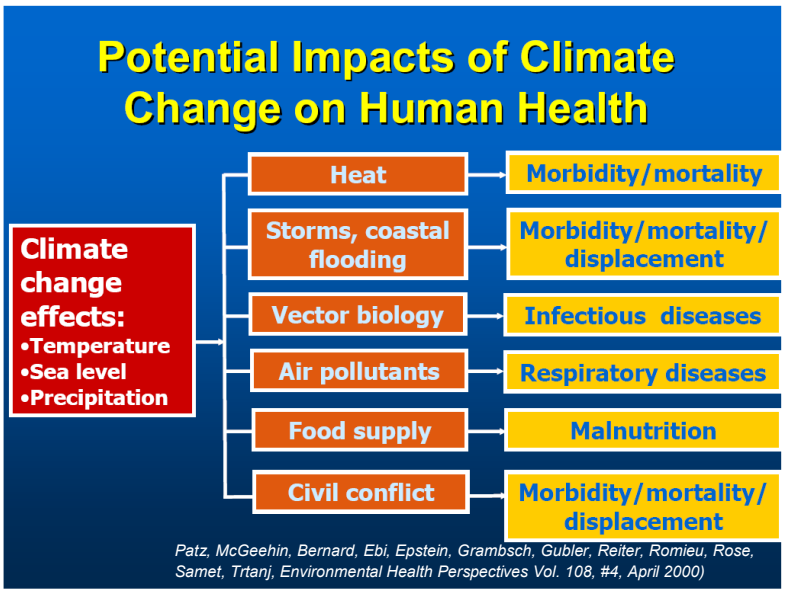
News from the University of Rochester Environmental Health Sciences Center (EHSC)

www2.envmed.rochester.edu/envmed/ehsc/outreach/COEPpubs/COEPpub.html

In this Issue:

Climate Change and Environmental Health

With increasing public concern about global climate change, public health professionals and researchers are focusing on the implications for human health. Research suggests that environmental effects of climate change such as heat stress, air pollutants, and changes in food and water supplies will directly and indirectly impact human health. Effects of climate change will disproportionately impact vulnerable populations like the poor, young, and elderly.



As Dr. Julie Gerberding, Director of the Center for Disease Control stated: "… we anticipate that as climate changes, there will be health consequences. It's impossible to believe there won't be, whether it's more natural disasters or a change in the pattern of them or whether it's vectors, mosquitoes that move to new habitats and diseases like malaria or West Nile or whether it's heat stroke and direct complications of heat. We believe there are unpredictable health consequences that will occur and our job is to anticipate what they might be, to make sure that we have systems in place that can detect them, and, most importantly, that we take steps now to be able to help mitigate whatever those harms are. " (*Testimony before the House Appropriations Committee, Subcommittee on Interior, Environment and Related Agencies, Hearing on Fiscal Year 2008Appropriations: Interior and Environment, March 2, 2007*)

In November 2007, EHSC Outreach Coordinator Katrina Korfmacher, Ph.D. and Program Manager Kate Kuholski attended the American Public Health Association's annual meeting in Washington, DC, where multiple sessions addressed the impacts of climate change on human health. Speakers addressed both the need for "mitigation" (reducing emissions of pollutants that contribute to the greenhouse effect) and "adaptation" (anticipating and responding to changes resulting from rising temperatures). They emphasized that many mitigation strategies have multiple benefits. For example, promoting energy efficiency both reduces fossil fuel consumption and particulate pollution, which benefits human health. Similarly, making cities more pedestrian- and bike-friendly combats both global warming and obesity. At the same time, the presentations emphasized the wide range of health impacts, ranging from the direct effects of increased storm intensity to the indirect impacts of the northward spread of malaria. A central theme was that human health impacts are not sufficiently recognized in the current policy debates about preventing and responding to climate change. Because of such concerns, the American Public Health Association's Environment Section has made climate change one of their top policy issues and has selected climate change as the theme of the next Public Health week (April 7-13, 2008; see www.apha.org).

This newsletter is supported by grant # ES01247 from National Institutes of Health NIEHS National Institute of Environmental Health Sciences ~ Your Environment is Your Health ~

Integrated Health Sciences Facility Core

Thanks and goodbye!

We are sad to report the departure of **Dr. Bill Beckett** after 11 years as director of the Finger Lakes Occupational Health clinic and a member of the Environmental Health Sciences Center. Dr. Beckett has been a key contributor to the COEC through advising individuals and groups on a wide range of environmental exposures. Dr. Beckett will be joining the staff of Mt. Auburn hospital in Cambridge, MA as of December, 2007. We thank him for his strong and ongoing support of our outreach and education efforts and wish him well in his new position.

Clinical and Translational Science Institute's Synergy with Environmental Medicine's Integrative Health Sciences Facility Core

William S. Beckett, M.D., M.P.H.,
Professor of Medicine and Environmental Medicine

Emphasis on developing clinical and translational research to improve the nation's health is occurring at many levels of the academic research enterprise. The University of Rochester Clinical and Translational Science Institute (CTSI) is one of 12 institutions nationwide with funding from the National Institutes of Health to lead the emerging field of clinical and translational research. The CTSI is building the foundation to assist researchers at the University of Rochester and across Upstate New York to produce innovative technology and methods that more efficiently and more quickly advance treatments to patients.

Almost simultaneously with the opening of University of Rochester's CTSI came a new initiative for the University's 35 year old Environmental Health Sciences Center, supported by the National Institute of Environmental Health Sciences (NIEHS). The NIEHS now requires its Centers to have an Integrated Health Sciences Facility Core to facilitate clinical and translational research by environmental health researchers.

Once an institute focused on animal and systems toxicology testing, the NIEHS took a dramatic turn toward patient oriented research, shifting emphasis from known toxins to the chronic diseases they may contribute to. Clinical investigators in Environmental Medicine have long utilized the University's Clinical Research Center for patient-oriented research. The impetus to assist our basic scientists in moving their work closer to the bedside and the community suggested a natural synergy with CTSI.

How do these two large research enterprises within the same institution join forces to achieve their mutual goals? As is usual in science, information is often the starting point. Recognizing natural areas of common interest between investigators who have not previously collaborated requires awareness of opportunities outside ones own department, sometimes outside one's own institution. With assistance from EHSC Project Manager, Kate Kuholski, a database of our own clinical research resources will be merged with that of CTSI and made available institution wide, with hopes to spark collaborations.

The next step, helping to establish durable and longstanding research collaborations, will require more than one approach. A huge strength of our institution, the daily care of thousands of patients per year with common chronic diseases, can-- with appropriate preparation and human subject consent-- make possible the analysis of patient-derived cell lines, proteins, and genes. The EHSC's Integrative Health Sciences Facility Core also plans to bring in investigators who have already succeeded to discuss their methods, and to develop a database of investigators in other NIEHS centers nationwide who may want to collaborate on specific proposals.

For more information, check out:
http://www.urmc.rochester.edu/ctsi/

Integrated Health Sciences Facility Core

Impact of Environmental Particulate Matter on Human Health and Innate Immunity

Marc A. Williams, Ph.D., Assistant Professor of Medicine and of Environmental Medicine.
For more information contact: marc_williams@urmc.rochester.edu

Particle pollution, often referred to as particulate matter (PM), is a combination of fine solids and aerosols that are suspended in the air that all of us inhale. PM is particularly hazardous because the particles vary in aerodynamic diameter, meaning that some particles are small enough to deposit deep in the lungs where they can impart serious damage. The largest types of PM of concern are 10 microns in diameter (PM_{10}). The group of most concern, however, is 2.5 microns in diameter or smaller ($PM_{2.5}$). Some of these are thought to be small enough to exit the lung and directly enter to the bloodstream just like oxygen molecules. Particulate matter is extremely hazardous to health. Even brief exposure (hours to days) to particle pollution may cause deaths in susceptible individuals due to respiratory and cardiovascular causes, including strokes; heart attacks (especially among the elderly and in people with heart conditions); inflammation of lung tissue in young, healthy adults; increased hospitalization for cardiovascular disease; increased emergency room visits for patients suffering from acute respiratory diseases as well as increased severity from or hospitalization for asthma in children. Year-round exposure to PM has been linked to increased hospitalization for asthma attacks in children; retarded lung function development and significant damage to the small airways of the lungs; increased risk of dying from lung cancer and increased risk of death from cardiovascular disease. Our recent publications have provided important and novel insights into how particulate pollution drives an unusual pattern of dendritic cell development and function that may be responsible, at least in part, for the allergic inflammatory response seen in asthma.

My group includes two highly talented research scientists; Dr Smruti Killedar (an Instructor in Medicine) and Dr Stephen Bauer (an NIH Post-Doctoral Research Fellow). The major focus of our current research is to understand the mechanisms whereby the immune system responds to and is adversely affected by inhaled particulates in the air we breathe. These inhaled particles include atmospheric particulate "soot," diesel exhaust particles and atmospheric allergens such as ragweed or birch pollen and even breakdown products of cockroaches and of course dust mites and so on.

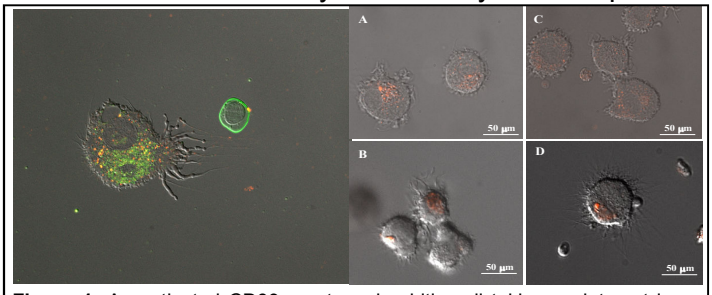


Figure 1: An activated CD83+ mature dendritic cell taking an interest in a CD4+ helper T cell (left hand panel). When DC encounter particulate matter, they become activated and interact with naïve CD4+ T cells in a way that stimulates production of cytokines that may provoke an allergic inflammatory reaction (e.g. high levels of IL-5 and IL-13) and exacerbations of asthma. [For more information, see: Williams MA, et al, Ambient Baltimore Particulate Matter Directs Non-Classical Immune Activation of Human Myeloid Dendritic Cells. *Journal of Allergy and Clinical Immunology* 119:488-497, 2007]. In addition, expression of Toll-Like Receptor 2 (TLR2) and TLR4 following stimulation of DC with PM is shown (right hand panels). Images A and B show TLR2 and images C and D are TLR4 without/with PM stimulation. We have comprehensively studied how particulate pollution drives an unusual pattern of dendritic cell development and function that may be responsible for the Th2-type allergic inflammatory phenotype seen in asthma. [For more information see: Williams MA, et al. TLR2 and TLR4 as potential biomarkers of environmental particulate matter exposed human myeloid dendritic cells. *Biomarker Insights* 2: 225-239, 2007; Porter M, et al. Diesel exhaust particles induce a novel pattern of pro-allergic dendritic cell activation. *American Journal of Respiratory Cell and Molecular Biology* E-pub Ahead of Print, July 13th 2007].

The focus of my research is to understand how inhaled particles contribute to allergic asthma and enable cells in the immune system to promote all the hallmarks of an allergic asthmatic attack such as wheezing, difficulty in breathing and, we believe, a subsequent increased susceptibility to infectious diseases of the lung. A specialized population of cells called dendritic cells (DC) are by far the most enigmatic and highly specialized of all cells in the immune system responsible for protecting us from infections (Figures 1, 2). However, despite their importance in providing protection from bacterial or viral infections, we believe dendritic cells are capable of unknowingly exacerbating asthma on encountering inhaled particulate pollutants and subsequently predisposing susceptible individuals to infections of the lung. We have initiated a laboratory-based clinical study of the immune responses of immune cells obtained from allergic asthmatic subjects as compared with non-allergic asthmatic subjects to see how they differ in their responses to particulate pollutants as compared with normal healthy individuals. In this way we hope to be able to identify possible novel therapeutic targeting of allergic asthma that may improve current management of this potentially debilitating and increasingly prevalent condition.

EHSC Pilot Project Program

Brain Cancer and Bone Lead Levels

Edwin Van Wijngaarden, Ph.D., Assistant Professor of Community and Preventative Medicine
For more information contact: Edwin_van_Wijngaarden@urmc.rochester.edu

The cause of brain cancer remains largely unknown. It is believed that exposure to environmental agents plays an important role in the development of this disease, although no definite links for specific chemicals have been established. The epidemiological literature on lead exposure and brain cancer is inconclusive.

However, this literature has been plagued with methodological limitations which limit the ability to detect an association, and several recent studies have provided evidence warranting a closer look at this question using more sophisticated methods. Additional suggestive evidence comes from studies reporting the development of brain tumors in rats after ingestion of lead salts. In 2004, the International Agency for Research on Cancer (IARC) classified inorganic lead compounds as probably carcinogenic to humans (Group 2A) based on sufficient evidence from animal studies and limited epidemiologic evidence."

In a pilot study funded by the Environmental Health Sciences Pilot Project Program, 19 patients with brain tumors (5 with meningioma, 14 with glioblastoma) have been recruited to measure bone lead levels and inquire about residential, occupational an medical histories, among others. Participating patients ranged between the ages of 27 and 88. Bone lead was measured at the tibia and calcaneus to estimate exposure to lead in different time periods of the patients' lives. The sessions took on average about 1 hour to complete, and were well tolerated by the patients in our study. The average bone lead level in our population is about 10 ìg per gram of bone mineral and generally did not exceed 30 ìg/g bone mineral. These levels are below the median levels reported in the Normative Aging Study and do not indicate that bone lead levels are excessive in our population of brain tumor patients. The median bone lead level in the Normative Aging Study (PI: Dr. Howard Hu) is between 18 and 43 ug per g bone mineral depending on the age group (ranging from 40-90+).

We will continue to recruit patients and analyze bone lead levels in the context of the participants' factors such as age, gender, and occupational and residential history. Lessons learned on the logistical challenges of conducting a hospital-based epidemiological study will provide guidance to the conduct of future, similar studies. Furthermore, this study is the first to measure bone lead levels in brain tumor patients. Therefore, we will seek to publish our preliminary findings in a peer-reviewed journal which will add valuable information to existing literature.

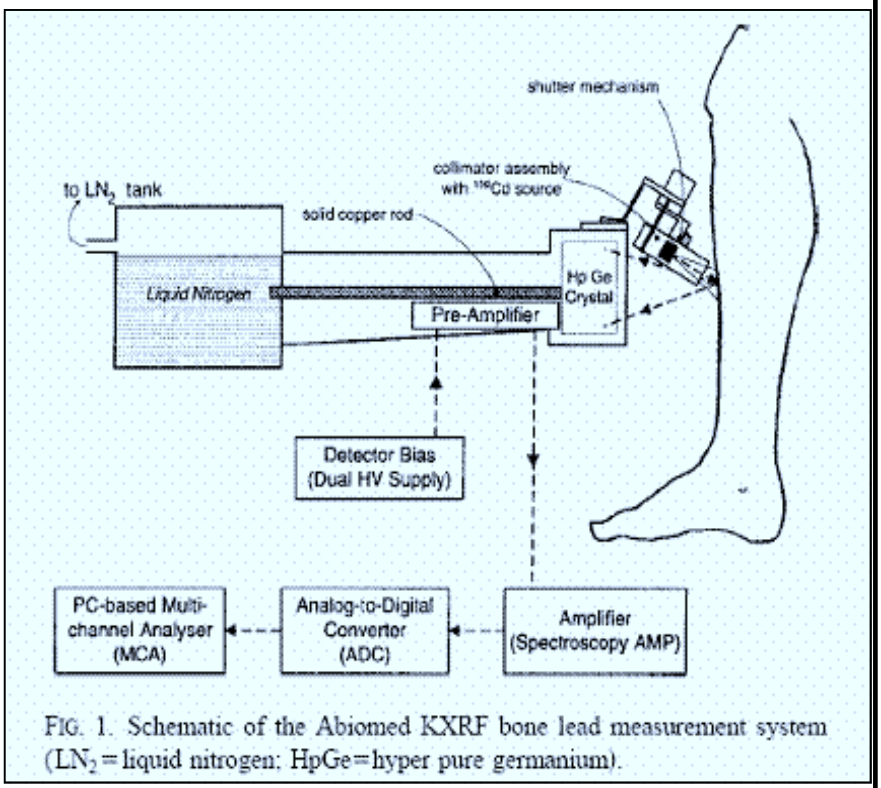


FIG. 1. Schematic of the Abiomed KXRF bone lead measurement system (LN_2 = liquid nitrogen; HpGe = hyper pure germanium).

Community Outreach & Education Core (COEC)

Rochester's Healthy Home

Regional Community Asthma Network's Beth Schlabach talking with Dr. Phillip Landrigan at Rochester's Healthy Home

The Healthy Home has been a busy place this year! A "Year One Pilot Project Report'' and "Guide to Replication" were created and distributed. In November, Katrina Korfmacher, PhD presented at the American Public Health Association's national conference in Washington, DC on "Promoting Environmental Health Policies Through a Model Healthy Home."

As of December 2007, over 1300 people have visited the Healthy Home. Recent notable guests include Roy A. Bernardi, Deputy Secretary, US Department of Housing and Urban Development and Dr. Phillip Landrigan of Mt. Sinai's Medical Center's Children's Environmental Health Center. Dr. Landrigan's visit to Rochester included presenting at grand rounds for the Department of Pediatrics and meeting with members of Rochester's Children's Environmental Health Center. Also, Dr. Landrigan gave a public talk on November 13 at the Breast Cancer Coalition on "Raising Healthy Children in a Toxic World: What Parents Can Do to Protect Their Children." The COEC is working with Rochester's Children's Environmental Health Center in order to develop a resource guide and database of the local organizations and programs which provide significant resources related to children's environmental health and will be provided to health care providers, home health care visitors, and other professionals. The Healthy Home is free and open for tours by groups or individuals. For more information contact healthyhomerochester@gmail.com or visit http://www2.envmed.rochester.edu/envmed/ehsc/outreach/CommunityPartners/CommunityPartnersHH.html

New York State Health Foundation funds University of Rochester to address childhood lead poisoning in three upstate communities

The Community Outreach and Education Core (COEC) of the Environmental Health Sciences Center has been awarded a one-year grant of $139,753 from the New York State Health Foundation to support development of lead poisoning prevention coalitions in three upstate cities. The COEC will work with the Rochester-based Coalition to Prevent Lead Poisoning (CPLP) as well as three local non-profit community groups in Elmira, Utica, and Auburn. The lessons learned through the COEC's seven-year partnership with the CPLP will be used to support community involvement in lead coalitions in each of the three partner cities.

Toxicology Training Program

Welcome to the entering students, Fall 2007!

Joshua Allen, *Ashland University, B.S. 2007*

Tha Thach, *University of Wisconsin/Madison, B.S. 2006*

Whitney Christian, *Davidson College, B.S. 2001*

Joseph Frasca, *Ithaca College, B.A. 2005*

Casey Manning, *Central Michigan University, B.S. 2006*

Melissa Badding, *Rochester Institute of Technology, B.S. 2007*

Your Health & The Environment

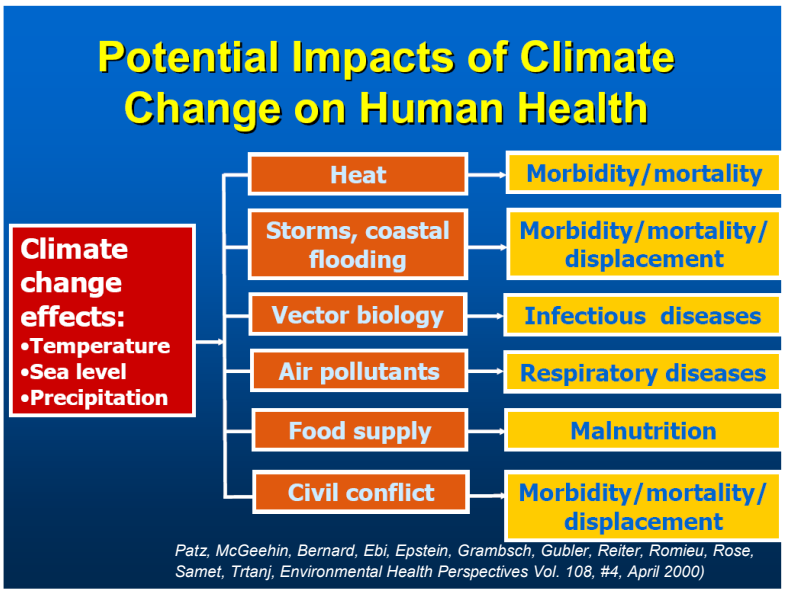
News from the University of Rochester Environmental Health Sciences Center (EHSC)

Winter 2007

www2.envmed.rochester.edu/envmed/ehsc/outreach/COEPpubs/COEPpub.html

Climate Change and Environmental Health

With increasing public concern about global climate change, public health professionals and researchers are focusing on the implications for human health. Research suggests that environmental effects of climate change such as heat stress, air pollutants, and changes in food and water supplies will directly and indirectly impact human health. Effects of climate change will disproportionately impact vulnerable populations like the poor, young, and elderly.



As Dr. Julie Gerberding, Director of the Center for Disease Control stated: "… we anticipate that as climate changes, there will be health consequences. It's impossible to believe there won't be, whether it's more natural disasters or a change in the pattern of them or whether it's vectors, mosquitoes that move to new habitats and diseases like malaria or West Nile or whether it's heat stroke and direct complications of heat. We believe there are unpredictable health consequences that will occur and our job is to anticipate what they might be, to make sure that we have systems in place that can detect them, and, most importantly, that we take steps now to be able to help mitigate whatever those harms are. " (*Testimony before the House Appropriations Committee, Subcommittee on Interior, Environment and Related Agencies, Hearing on Fiscal Year 2008Appropriations: Interior and Environment, March 2, 2007*)

In November 2007, EHSC Outreach Coordinator Katrina Korfmacher, Ph.D. and Program Manager Kate Kuholski attended the American Public Health Association's annual meeting in Washington, DC, where multiple sessions addressed the impacts of climate change on human health. Speakers addressed both the need for "mitigation" (reducing emissions of pollutants that contribute to the greenhouse effect) and "adaptation" (anticipating and responding to changes resulting from rising temperatures). They emphasized that many mitigation strategies have multiple benefits. For example, promoting energy efficiency both reduces fossil fuel consumption and particulate pollution, which benefits human health. Similarly, making cities more pedestrian- and bike-friendly combats both global warming and obesity. At the same time, the presentations emphasized the wide range of health impacts, ranging from the direct effects of increased storm intensity to the indirect impacts of the northward spread of malaria. A central theme was that human health impacts are not sufficiently recognized in the current policy debates about preventing and responding to climate change. Because of such concerns, the American Public Health Association's Environment Section has made climate change one of their top policy issues and has selected climate change as the theme of the next Public Health week (April 7-13, 2008; see www.apha.org).

This newsletter is supported by grant # ES01247 from National Institutes of Health NIEHS National Institute of Environmental Health Sciences ~ Your Environment is Your Health ~

Integrated Health Sciences Facility Core

Thanks and goodbye!

We are sad to report the departure of **Dr. Bill Beckett** after 11 years as director of the Finger Lakes Occupational Health clinic and a member of the Environmental Health Sciences Center. Dr. Beckett has been a key contributor to the COEC through advising individuals and groups on a wide range of environmental exposures. Dr. Beckett will be joining the staff of Mt. Auburn hospital in Cambridge, MA as of December, 2007. We thank him for his strong and ongoing support of our outreach and education efforts and wish him well in his new position.

Clinical and Translational Science Institute's Synergy with Environmental Medicine's Integrative Health Sciences Facility Core

William S. Beckett, M.D., M.P.H.,
Professor of Medicine and Environmental Medicine

Emphasis on developing clinical and translational research to improve the nation's health is occurring at many levels of the academic research enterprise. The University of Rochester Clinical and Translational Science Institute (CTSI) is one of 12 institutions nationwide with funding from the National Institutes of Health to lead the emerging field of clinical and translational research. The CTSI is building the foundation to assist researchers at the University of Rochester and across Upstate New York to produce innovative technology and methods that more efficiently and more quickly advance treatments to patients.

Almost simultaneously with the opening of University of Rochester's CTSI came a new initiative for the University's 35 year old Environmental Health Sciences Center, supported by the National Institute of Environmental Health Sciences (NIEHS). The NIEHS now requires its Centers to have an Integrated Health Sciences Facility Core to facilitate clinical and translational research by environmental health researchers.

Once an institute focused on animal and systems toxicology testing, the NIEHS took a dramatic turn toward patient oriented research, shifting emphasis from known toxins to the chronic diseases they may contribute to. Clinical investigators in Environmental Medicine have long utilized the University's Clinical Research Center for patient-oriented research. The impetus to assist our basic scientists in moving their work closer to the bedside and the community suggested a natural synergy with CTSI.

How do these two large research enterprises within the same institution join forces to achieve their mutual goals? As is usual in science, information is often the starting point. Recognizing natural areas of common interest between investigators who have not previously collaborated requires awareness of opportunities outside ones own department, sometimes outside one's own institution. With assistance from EHSC Project Manager, Kate Kuholski, a database of our own clinical research resources will be merged with that of CTSI and made available institution wide, with hopes to spark collaborations.

The next step, helping to establish durable and longstanding research collaborations, will require more than one approach. A huge strength of our institution, the daily care of thousands of patients per year with common chronic diseases, can-- with appropriate preparation and human subject consent-- make possible the analysis of patient-derived cell lines, proteins, and genes. The EHSC's Integrative Health Sciences Facility Core also plans to bring in investigators who have already succeeded to discuss their methods, and to develop a database of investigators in other NIEHS centers nationwide who may want to collaborate on specific proposals.

For more information, check out:
http://www.urmc.rochester.edu/ctsi/

Research Highlights

Impact of Environmental Particulate Matter on Human Health and Innate Immunity

Marc A. Williams, Ph.D., Assistant Professor of Medicine and of Environmental Medicine.
For more information contact: marc_williams@urmc.rochester.edu

Particle pollution, often referred to as particulate matter (PM), is a combination of fine solids and aerosols that are suspended in the air that all of us inhale. PM is particularly hazardous because the particles vary in aerodynamic diameter, meaning that some particles are small enough to deposit deep in the lungs where they can impart serious damage. The largest types of PM of concern are 10 microns in diameter (PM_{10}). The group of most concern, however, is 2.5 microns in diameter or smaller ($PM_{2.5}$). Some of these are thought to be small enough to exit the lung and directly enter to the bloodstream just like oxygen molecules. Particulate matter is extremely hazardous to health. Even brief exposure (hours to days) to particle pollution may cause deaths in susceptible individuals due to respiratory and cardiovascular causes, including strokes; heart attacks (especially among the elderly and in people with heart conditions); inflammation of lung tissue in young, healthy adults; increased hospitalization for cardiovascular disease; increased emergency room visits for patients suffering from acute respiratory diseases as well as increased severity from or hospitalization for asthma in children. Year-round exposure to PM has been linked to increased hospitalization for asthma attacks in children; retarded lung function development and significant damage to the small airways of the lungs; increased risk of dying from lung cancer and increased risk of death from cardiovascular disease. Our recent publications have provided important and novel insights into how particulate pollution drives an unusual pattern of dendritic cell development and function that may be responsible, at least in part, for the allergic inflammatory response seen in asthma.

My group includes two highly talented research scientists; Dr Smruti Killedar (an Instructor in Medicine) and Dr Stephen Bauer (an NIH Post-Doctoral Research Fellow). The major focus of our current research is to understand the mechanisms whereby the immune system responds to and is adversely affected by inhaled particulates in the air we breathe. These inhaled particles include atmospheric particulate "soot," diesel exhaust particles and atmospheric allergens such as ragweed or birch pollen and even breakdown products of cockroaches and of course dust mites and so on.

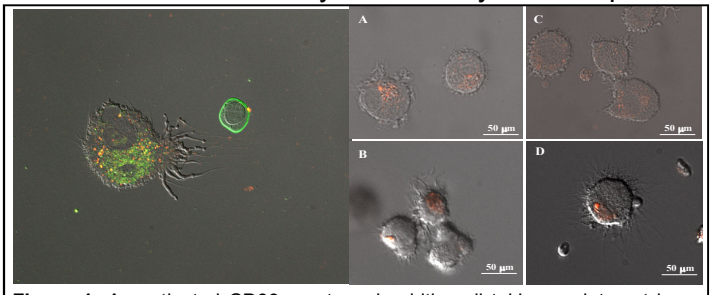


Figure 1: An activated CD83+ mature dendritic cell taking an interest in a CD4+ helper T cell (left hand panel). When DC encounter particulate matter, they become activated and interact with naïve CD4+ T cells in a way that stimulates production of cytokines that may provoke an allergic inflammatory reaction (e.g. high levels of IL-5 and IL-13) and exacerbations of asthma. [For more information, see: Williams MA, et al, Ambient Baltimore Particulate Matter Directs Non-Classical Immune Activation of Human Myeloid Dendritic Cells. *Journal of Allergy and Clinical Immunology* 119:488-497, 2007]. In addition, expression of Toll-Like Receptor 2 (TLR2) and TLR4 following stimulation of DC with PM is shown (right hand panels). Images A and B show TLR2 and images C and D are TLR4 without/with PM stimulation. We have comprehensively studied how particulate pollution drives an unusual pattern of dendritic cell development and function that may be responsible for the Th2-type allergic inflammatory phenotype seen in asthma. [For more information see: Williams MA, et al. TLR2 and TLR4 as potential biomarkers of environmental particulate matter exposed human myeloid dendritic cells. *Biomarker Insights* 2: 225-239, 2007; Porter M, et al. Diesel exhaust particles induce a novel pattern of pro-allergic dendritic cell activation. *American Journal of Respiratory Cell and Molecular Biology* E-pub Ahead of Print, July 13th 2007].

The focus of my research is to understand how inhaled particles contribute to allergic asthma and enable cells in the immune system to promote all the hallmarks of an allergic asthmatic attack such as wheezing, difficulty in breathing and, we believe, a subsequent increased susceptibility to infectious diseases of the lung. A specialized population of cells called dendritic cells (DC) are by far the most enigmatic and highly specialized of all cells in the immune system responsible for protecting us from infections (Figures 1, 2). However, despite their importance in providing protection from bacterial or viral infections, we believe dendritic cells are capable of unknowingly exacerbating asthma on encountering inhaled particulate pollutants and subsequently predisposing susceptible individuals to infections of the lung. We have initiated a laboratory-based clinical study of the immune responses of immune cells obtained from allergic asthmatic subjects as compared with non-allergic asthmatic subjects to see how they differ in their responses to particulate pollutants as compared with normal healthy individuals. In this way we hope to be able to identify possible novel therapeutic targeting of allergic asthma that may improve current management of this potentially debilitating and increasingly prevalent condition.

EHSC Pilot Project Program

Brain Cancer and Bone Lead Levels

Edwin Van Wijngaarden, Ph.D., Assistant Professor of Community and Preventative Medicine
For more information contact: Edwin_van_Wijngaarden@urmc.rochester.edu

The cause of brain cancer remains largely unknown. It is believed that exposure to environmental agents plays an important role in the development of this disease, although no definite links for specific chemicals have been established. The epidemiological literature on lead exposure and brain cancer is inconclusive.

However, this literature has been plagued with methodological limitations which limit the ability to detect an association, and several recent studies have provided evidence warranting a closer look at this question using more sophisticated methods. Additional suggestive evidence comes from studies reporting the development of brain tumors in rats after ingestion of lead salts. In 2004, the International Agency for Research on Cancer (IARC) classified inorganic lead compounds as probably carcinogenic to humans (Group 2A) based on sufficient evidence from animal studies and limited epidemiologic evidence."

In a pilot study funded by the Environmental Health Sciences Pilot Project Program, 19 patients with brain tumors (5 with meningioma, 14 with glioblastoma) have been recruited to measure bone lead levels and inquire about residential, occupational an medical histories, among others. Participating patients ranged between the ages of 27 and 88. Bone lead was measured at the tibia and calcaneus to estimate exposure to lead in different time periods of the patients' lives. The sessions took on average about 1 hour to complete, and were well tolerated by the patients in our study. The average bone lead level in our population is about 10 ìg per gram of bone mineral and generally did not exceed 30 ìg/g bone mineral. These levels are below the median levels reported in the Normative Aging Study and do not indicate that bone lead levels are excessive in our population of brain tumor patients. The median bone lead level in the Normative Aging Study (PI: Dr. Howard Hu) is between 18 and 43 ug per g bone mineral depending on the age group (ranging from 40-90+).

We will continue to recruit patients and analyze bone lead levels in the context of the participants' factors such as age, gender, and occupational and residential history. Lessons learned on the logistical challenges of conducting a hospital-based epidemiological study will provide guidance to the conduct of future, similar studies. Furthermore, this study is the first to measure bone lead levels in brain tumor patients. Therefore, we will seek to publish our preliminary findings in a peer-reviewed journal which will add valuable information to existing literature.

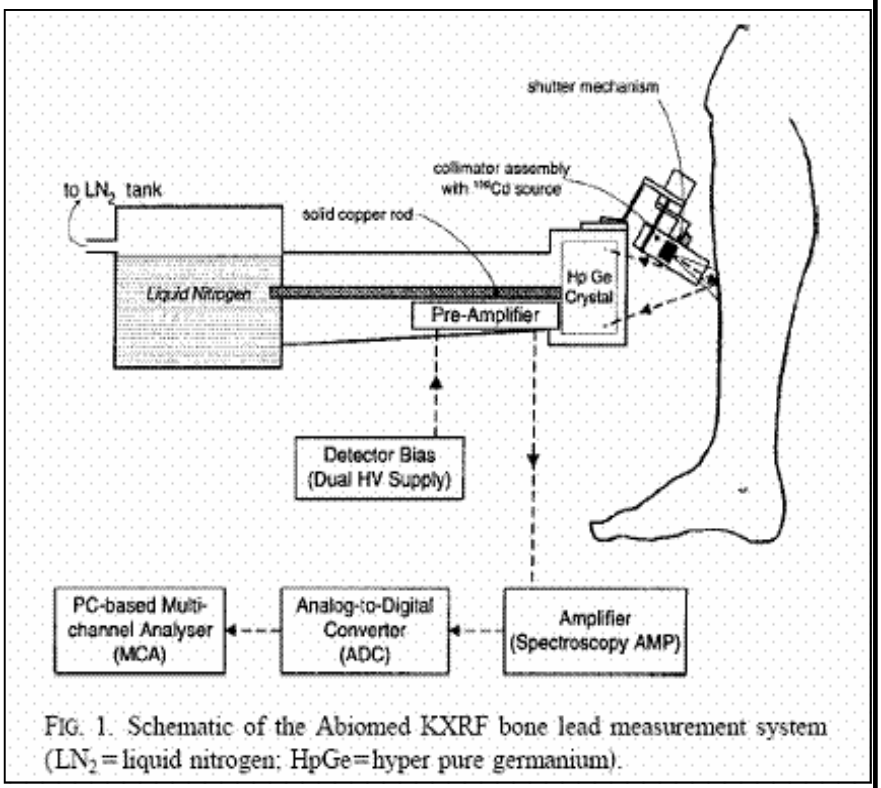


FIG. 1. Schematic of the Abiomed KXRF bone lead measurement system (LN_2 = liquid nitrogen; HpGe = hyper pure germanium).

Community Outreach & Education Core (COEC)

Rochester's Healthy Home

Regional Community Asthma Network's Beth Schlabach talking with Dr. Phillip Landrigan at Rochester's Healthy Home

The Healthy Home has been a busy place this year! A "Year One Pilot Project Report'' and "Guide to Replication" were created and distributed. In November, Katrina Korfmacher, PhD presented at the American Public Health Association's national conference in Washington, DC on "Promoting Environmental Health Policies Through a Model Healthy Home."

As of December 2007, over 1300 people have visited the Healthy Home. Recent notable guests include Roy A. Bernardi, Deputy Secretary, US Department of Housing and Urban Development and Dr. Phillip Landrigan of Mt. Sinai's Medical Center's Children's Environmental Health Center. Dr. Landrigan's visit to Rochester included presenting at grand rounds for the Department of Pediatrics and meeting with members of Rochester's Children's Environmental Health Center. Also, Dr. Landrigan gave a public talk on November 13 at the Breast Cancer Coalition on "Raising Healthy Children in a Toxic World: What Parents Can Do to Protect Their Children." The COEC is working with Rochester's Children's Environmental Health Center in order to develop a resource guide and database of the local organizations and programs which provide significant resources related to children's environmental health and will be provided to health care providers, home health care visitors, and other professionals. The Healthy Home is free and open for tours by groups or individuals. For more information contact healthyhomerochester@gmail.com or visit http://www2.envmed.rochester.edu/envmed/ehsc/outreach/CommunityPartners/CommunityPartnersHH.html

New York State Health Foundation funds University of Rochester to address childhood lead poisoning in three upstate communities

The Community Outreach and Education Core (COEC) of the Environmental Health Sciences Center has been awarded a one-year grant of $139,753 from the New York State Health Foundation to support development of lead poisoning prevention coalitions in three upstate cities. The COEC will work with the Rochester-based Coalition to Prevent Lead Poisoning (CPLP) as well as three local non-profit community groups in Elmira, Utica, and Auburn. The lessons learned through the COEC's seven-year partnership with the CPLP will be used to support community involvement in lead coalitions in each of the three partner cities.

Toxicology Training Program

Welcome to the entering students, Fall 2007!

Joshua Allen, *Ashland University, B.S. 2007*

Tha Thach, *University of Wisconsin/Madison, B.S. 2006*

Whitney Christian, *Davidson College, B.S. 2001*

Joseph Frasca, *Ithaca College, B.A. 2005*

Casey Manning, *Central Michigan University, B.S. 2006*

Melissa Badding, *Rochester Institute of Technology, B.S. 2007*