

**DEPARTMENT OF ENVIRONMENTAL
HEALTH SCIENCES**

EHT 690: Laboratory Rotations

Fall 2008

DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCES

Information Booklet for EHT 690: Laboratory Rotations

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1. General information

The selection of a rotation project is one of the first and most important decisions that a new graduate student will make. The decision may determine the direction your dissertation research project may take and ultimately send you on your career path.

Selection and completion of rotation projects is a collaborative effort between the student, the faculty project mentor and the rotation coordinator. The rotation coordinator assists the student in finding the project that best matches the student's interests and objectives. The selection of a rotation project by the student is made in agreement with a faculty mentor for the project. The mentor guides the student through the project and the preparation of a report. The coordinator checks on the student's progress through the rotation, reviews the report, and assists the mentor in establishing a final grade.

This booklet contains information to help you understand the requirements and provides a time line for completing the two Lab Rotations. It contains a listing of rotation projects and mentors, and sample student-faculty mentor agreement form, mentor evaluation and student evaluation forms. **These forms can be obtained from www.wadsworth.org/sph/ehs/forms/index.html.** The evaluation forms should be completed at the end of each rotation. You should read this information as soon as possible. Then you should meet with potential faculty mentors and decide upon your first rotation project. Complete the student-faculty mentor agreement form and submit copies to the rotation coordinator and the department office so that you can get started on your lab rotation project as soon as possible and no later than **September 2**.

The rotation coordinator is Ilham AlMahamid, Ph.D. She is located in room D-568C and can be reached by phone: (518) 474-6095 or e-mail: ialmaham@wadsworth.org. The contact and/or location information for each faculty mentor is listed with the project descriptions.

2. Course description for EHT 690: LABORATORY ROTATIONS

The aims of the laboratory rotations are:

1. To allow the student to interact with scientists of varied disciplines.
2. To introduce the student to analytical, field and laboratory techniques and principles.
3. To give both the students and the faculty an opportunity to interact intellectually.
4. To aid the student in selecting a mentor for graduate research.

All students must participate in the rotations. Students may not repeat a rotation with the same mentor. Exceptions to this plan are subject to approval of the Department Chairman. The student is expected to dedicate **at least 12 hours per week** to each rotation.

Rotation Schedule: Ph.D. and M.S. students will take two rotations for a total of three credits. Each rotation in the semester will last 7 weeks. The grading system is S/U. An unsatisfactory grade in any rotation will result in a U for that semester. Please note that a satisfactory grade in **BOTH** rotations must be attained to fulfill the rotation requirement. A Rotations Coordinator (hereafter “Coordinator”) will help match students with appropriate Faculty Research Mentors (hereafter “Mentors”).

The rotation schedule is designed to obtain the maximum analytical, field, and laboratory experience within the framework of courses and additional graduate responsibilities.

Student Obligations: A student may choose to work with any faculty member within the Department of Environmental Health Sciences. The student may be working in the field, laboratory, or office environment, or some combination thereof. The student may not spend the entire rotation time exclusively in an office setting. The equivalent of one rotation’s time must be spent in a field or laboratory setting, or a combination of these settings. An office-based rotation must be spent learning skills directly applicable to carrying out scientific research. Some examples of acceptable office- based rotation activities are: Statistical analysis of databases, computer modeling of data, and mapping using a geographic information system (GIS). Special permission may be given to a student who wishes to complete a lab rotation with a faculty member in one of the school's other departments.

At the end of each rotation, the students are required to write a **formal** report describing their project. This report should be graded and signed by the Mentor before submission of copies to both the Coordinator and the departmental office. Note that the final version of the report should be submitted to the Department Office no more than one week after the end of a rotation. The student is responsible for submitting this report, and failure to do so will result in an “incomplete” grade. The Mentor also should complete an evaluation form and review it with the student before submitting copies to both the Coordinator and the departmental office for assignment of a final grade.

Research Mentor and Rotations Coordinator Obligations

Research Mentor Responsibilities

- Notify Rotations Coordinator about possible research opportunities;
- Supply descriptive material about the research to the student and/or Coordinator;
- Meet with students to discuss opportunities;
- Approve or disapprove cross-over projects between Centers in the Health Department (e.g. Wadsworth and Environmental Health) and recommend alternative;
- Mentor research by providing direction, space and resources;
- Work with Coordinator to determine and submit grades.

Rotations Coordinator Responsibilities

- Assist student in finding a Research Mentor;
- Assist student placement in cross-over rotations projects;
- Verify that the project meets with the Track Coordinator and Research Mentor's approval;
- Track student progress;
- Collect all progress reports;
- Collect and submit project grades in cooperation with Research Mentors;
- The Rotation Coordinator is also responsible for obtaining the "EHS Rotation Evaluation Form". This form may be obtained from the Department Office. It should be clear that the Coordinator will work with both mentors in a given semester to determine and submit a final grade. *In order to meet University at Albany grading deadlines, the evaluation must be submitted to the Department Office no later than one week after the rotation has been completed or by the last day of the week of Final Examinations.*

3. Time line for completion of rotations, Fall 2008.

First rotation begins:	August 25 (no later than September 2)
First rotation ends:	October 15
Project report to mentor due:	October 17
Grade due:	October 24
Second rotation begins:	October 20
Second rotation ends:	December 10
Project report to mentor due:	December 12
Grade due:	December 18

4. General guidelines for project report

A rotation project report should follow the format of those that are typically prepared by the mentor.

For lab based research: A report is prepared as a manuscript would be for submission to a scientific journal. This would include: an Abstract that briefly summarizes the report; an Introduction, providing background and stating the purpose or specific aims of the project; a Methods and Materials sections with enough detail that would permit reproduction by someone in an external lab; a Results section describing the results of the experiments and providing data in the form of figures, tables or graphs; a Discussion section in which the significance of the results are explained with some attempt to relate them to public health issues; and finally a list of References cited in the text that document your sources of information. See the University guidelines for information regarding plagiarism and proper citation of references.

For office-based, service, or field testing projects: A summary report is similar to the type that might be sent to a lab chief, a regulatory agency, a city, county or state health official or to a contracting agency. This report should have enough information to be understood by someone outside the area of expertise or a layperson, if appropriate.

The length of the report is flexible. It should be of adequate length to fulfill the above criteria. Brevity is preferred over verbosity. The mentor should realize that this is a first attempt for most students. The student will need a great deal of guidance with this process. The report should be something that is developed throughout the rotation with frequent interaction between the student and mentor. However, the report should not be the primary focus of the rotation. The practical experience of engagement in a laboratory, office or field-based research project should be the primary focus. The final report should grow naturally out of the work performed during the rotation. The report should not be an afterthought ignored until the last week of the rotation.

The mentor should assign a **letter grade** to the report, sign it and submit copies to both the rotation coordinator and the department office.

The mentor and the student also should complete an evaluation form and review it together before submitting copies to both the Coordinator and the departmental office for assignment of a final grade.

5. Mentor and Project Descriptions for EHT690: Laboratory Rotations

The following information is provided for each mentor who submitted a project this year.

1. The mentor's name, title, and location.
2. A description of a research, service, or field testing project a new graduate student would be able to perform during a seven-week rotation.
3. An indication of whether the project is field, laboratory or office-based.

The descriptions are arranged by Track discipline and then alphabetically by **mentor**.

Environmental Chemistry Track

Mentor: **Katherine T. Alben**, PhD, Assistant Professor, D300, ESP

Projects:

The photosynthetic pigments - chlorophylls and carotenoids - are among the most beautiful of small molecules found in nature. Biologically, they are known to play important functions in vision, in reproduction, in the neuroendocrine system, and in the immune system. Chemically, they are known for their ability to bind with fatty acids and proteins, to partition to membranes, to absorb light, and to react with oxidants.

Our laboratory is primarily interested in analysis of carotenoids, retinoids, tocopherols and lipids in diverse samples collected from the Great Lakes:

- a) algae, macrophytes, sediment cores: to understand processes for cycling of biomass and to screen for changes in algal productivity as function of time, resulting from changes in environmental management and ecology (discharges of nutrients; growth of non-native filter-feeding mussels, changes in climate)
- b) biological organisms (eg bivalves; gastropods; crustaceans; fish): to gain insight into the diet of aquatic organisms, pathways for utilization of algal carotenoids, and food-web relationships among organisms

Pigment composition is determined by preparation of solvent extracts, which are analyzed by HPLC with photodiode array detection (PDA), and ultimately, APCI-ion trap mass spectrometry. Funding has been provided by US EPA Great Lakes National Program Office and New York Sea Grant: results on these projects are given in PhD dissertations by Maxime Bridoux and Monika Sobiechowska, completed in August 2008.

Lab rotations would typically involve experience comparing different techniques in a method of analysis (sample preparation; instrumental conditions), and comparing the composition of different, but related, sample types (biological specimens or sediments). As work progresses, experimental results should be fully interpreted and written up as technical reports which combine to make the final report. Examples of short-term projects of immediate interest include:

- a) LC-PDA/APCI-ion trap-MS determination of i) spectra and calibration curves for several standard pigments in diatoms; ii) molecular weights and structures of several relatively abundant unknowns in select extracts of mussels; iii) ability to decrease background but maintain high resolution separation of fatty acid esters of carotenoids in crustaceans, by substituting acetonitrile for acetone in mobile phase preparation; iv)

formation of acetonitrile adducts by polyunsaturated fatty acids in esters of carotenoids and retinol

- b) UPLC-PDA/FI versus conventional HPLC-PDA/FI analysis: optimization of instrumental conditions for determination of carotenoids and chlorophylls with maximum resolution in minimum time, and comparable sensitivity

Specific projects depend on the balance of students' interests and on related activities in the lab at the time of the rotation.

Mentor: **Robert G. Briggs**, Ph.D., Adjunct Clinical Assistant Professor, Supervisor: Routine Organic GC/MS analysis, D234, ESP, Wadsworth Center
(518) 474-5838, briggs@wadsworth.org

Project for one, or possibly two semesters: We have been looking at river waters near possible sources of pharmaceuticals and in some cases are confronted with complex mixtures of substances. We have identified over 200 components by GC/MS, but due to the complexity of the extracts of these samples, the GC methods we have used are not capable of fully resolving these components. We would like to follow up on 2 dimensional GC/FID methods developed by Shijun Lu and apply his system to our samples.

The first phase of this project would be to run standard mixtures of the substances we have identified and characterize their behavior in this 2D GC system.

The second phase would be to apply the method to actual samples and determine its suitability for qualitative and quantitative analysis.
Laboratory based

Mentor: **Liang T. Chu**, Ph.D., Associate Professor, Office: D568A, Lab: D366B, ESP.

Project: Uptake and heterogeneous reactions on ice surfaces

The project is aimed to understand how snow/ice and aerosols are affected by organic acids in the atmosphere. Organic acids have impact on aerosol growth rate and subsequently affect ozone distribution and climate.

The project will involve the study of hydrogen peroxide and formic acid uptake on ice surfaces and heterogeneous reaction between NH_3 and formic acid on ice surfaces. The ice surface mimics clouds and snow/ice in the atmosphere. The study will be conducted using both the wall coated flow-reactor and the specular reflection-absorption FTIR with temperature-programmed desorption apparatus in the laboratory. Students will learn both mass spectrometry and FTIR spectroscopy. Laboratory based.

Mentor: **Liaquat Husain, Ph.D.**, Professor, Lab Chief/ Laboratory of Inorganic and Nuclear Chemistry, D220, ESP.

Our research is focused on the studies of emissions, chemical transformation, and atmospheric transport of trace elements, sulfur dioxide, elemental and organic carbon, and

their fates in the atmosphere. These studies have important implications in the assessment of acid rain, air quality, and long-term changes in earth's climate. Major conclusions have been: (1) measurements of sulfate concentrations in aerosols at two locations 530 km apart in New York State over a quarter century have established that a quantitative relationship exists between the regional sulfur dioxide emissions in the Midwestern US and sulfate concentrations in the northeastern US. Therefore, a reduction in the emissions in the Midwest would result in a proportional decrease in acid deposition in the northeastern US; (2) like sulfate, concentrations of trace elements over two decades have also decreased over the past two decades. Apparently, the regulations restricting sulfur dioxide and particulate emissions have resulted in decreases in the Adirondacks of 16% per year for mercury, 14% for lead, 3 to 5% for K, Mn, Sc, and Fe.

Thus, regulations under the Clean Air Act have resulted in not only decreases in acid rain causing sulfate aerosols but also improvement in air quality due to reduction in the atmospheric burden of toxic metals. Our current work is focused on determining atmospheric burden of elemental or black carbon (EC) over the last ~150 years and using the data to (1) estimate the effect of EC on the amount of radiation received by the earth, and associated changes in the earth's temperature, cloud cover, and climate.

Mentor: **Haider A. Khwaja**, Ph.D., Assistant Professor, D308, ESP, 474-0516.

Project: My research interests lie in the study of multiphase atmospheric chemistry. In particular, I am interested in understanding the processes controlling the fate of inorganic and organic pollutants in the environment. One of the active research projects includes comprehensive understanding of carboxylic acids in the gas and in airborne particulate matter. Field and laboratory-based study.

Mentor: **Patrick J. Parsons Ph.D.**, Professor, Lead Poisoning/Trace Elements Laboratory, D144, ESP.

The primary focus of our research is the chemical characterization of trace elements in biological tissues and fluids. Such studies are important for understanding the biochemical role of essential trace elements, and for monitoring human exposure to toxic elements such as lead.

In addition to five graphite furnace atomic absorption instruments, we have three inductively coupled plasma-mass spectrometers (ICP-MS) capable of measuring the stable isotopes of more than 70 elements, many at parts-per-trillion levels. These state-of-the-art instruments are equipped with the Dynamic Reaction Cell (DRC) technology that reduces interferences and can be used to achieve high accuracy measurements of trace elements in human body fluids. Two of the ICP-MS instruments are coupled to Class 100 clean rooms: one interfaced to a liquid chromatographic (LC) system that is interfaced to the ICP-MS for arsenic speciation work, the other is coupled to a Laser Ablation (LA) system for spatial distribution studies. The third ICP-MS instrument is equipped with electrothermal vaporization (ETV) capability. Elements of public health interest include those of toxic significance (arsenic, lead, cadmium, mercury, aluminum) and those considered essential (zinc, copper, cobalt, manganese). We have implemented standard clinical operating

procedures for the routine use of the ICP-MS, but one of our other primary goals is to develop well-characterized blood, serum and urine reference materials that are certified for trace element content. We have also installed instrumentation for the determination of arsenic based on hydride generation atomic fluorescence spectrometry (HG-AFS).

We have several potential lab-based projects suitable for rotation students.

Project 1: The analysis of various tissues such as human brain and/or animal bone samples using LA-ICP-MS to map the distribution of select elements. The student will be expected to learn about the ICP-MS instrument, and how to set up the LA accessory, how to operate in the DRC mode, and how to control for contamination at low levels. This project will be conducted in collaboration with Dr. David Bellis in the Trace Elements Laboratory.

Project 2: We plan to set up a method to interface a gas chromatograph with ICP-MS to measure specific mercury species in whole blood. The project will require the student to work with a senior staff member in setting up a GC, interfacing it to an ICP-MS instrument using a custom heated interface, and separating three mercury species, inorganic Hg²⁺, methylmercury and ethylmercury in a blood matrix. If time permits, we may explore implementing isotope dilution ICP-MS with GC separation for quantitation of these Hg species in NIST SRM 955c. This project will be conducted in collaboration with Dr. Christopher Palmer in the Trace Elements Laboratory.

For more general lab information, and a list of recent publications, visit our web site at <http://www.wadsworth.org/testing/lead/index.htm>.

Mentor: **Thomas M. Semkow**, Assistant Professor, Biggs Laboratory, Room D486, Phone: 474-6071, E-mail: tms15@health.state.ny.us

Project 1: We are interested in the determination of alpha-emitting radionuclides in environmental samples for emergency response to incidents involving ionizing radiation, such as accidents and terrorist acts. Alpha emitters can be determined by counting, alpha spectroscopy, or mass spectroscopy. In this project we are concerned with the counting and alpha spectroscopy. There are a variety of research tasks which can be undertaken by interested students. The tasks include preparation of samples for alpha counting, measurements of alpha spectra using an ion chamber as well as counting on an ultra-low background proportional counter. Other assignments involve interpretation of spectra and plotting the results.

Project 2 (starting Spring 2008): This project involves reduction of radiation background in the existing WC environmental gamma radiation measuring facility. Gamma radiation measurements are used in New York State mandated programs of ionizing radiation surveillance in water, air, food, vegetation, soil, as well as in nuclear emergency response. During 2006 and 2007, we have been participating in mapping out contamination of ground water from spent nuclear fuel tank at Indian Point nuclear reactor in Buchanan, NY. One of the persistent contaminants is cesium, a long-lived fission product which emits gamma radiation. In order to precisely determine the radioactive plume gradient, which is necessary for predicting the future plume behavior, one has to measure high and low levels

of radioactivity, the latter requiring very low external radiation background. The rotation student involvement includes testing of plastic scintillators to detect cosmic-ray muons. The laboratory work consists primarily of working with electronic and computer instrumentation.

Mentor: **David C. Spink**, Ph.D., Associate Professor, E410, ESP.
Phone: 486-2532, E-mail: spink@wadsworth.org

Project: Studies in our laboratory are focused on the complex interactions between estrogen and environmental contaminants in the initiation of human breast cancer. Estrogens have long been associated with breast cancer, because numerous risk factors for the disease relate to a woman's lifelong exposure to endogenous and exogenous estrogen. While prevailing theories for the role of estrogen in carcinogenesis in the mammary gland have been focused on the stimulation of breast-cell proliferation by estrogen, there is also evidence that reactive metabolites produced by cytochrome P450 (CYP)-catalyzed metabolism of exogenous compounds and endogenous estrogens are involved in mutagenesis and breast cancer initiation. The aryl hydrocarbon receptor (AhR), which binds to and is activated by polycyclic aromatic hydrocarbons and other environmental contaminants, controls the expression of CYP1A1 and CYP1B1, enzymes that are known to catalyze the metabolism of numerous procarcinogens to ultimate carcinogens and estrogens to catechol estrogens.

Our research is based on the novel hypothesis that a significant role of estrogens in breast carcinogenesis is the up-regulation of AhR expression, leading to elevated expression and inducibility of the carcinogen-bioactivating enzymes, CYP1A1 and CYP1B1, and a greater propensity for mutations and the initiation of carcinogenesis. A laboratory rotation project would involve determining the time course, dose-response for estrogen, and effects of antiestrogens, LY117019 (Lilly) and ICI182780 (Tocris), on AhR, CYP1A1 and CYP1B1 expression in MCF-7 cells at the mRNA, protein and enzyme activity levels. This is a laboratory-based project.

Mentor: **James S. Webber**, Ph.D., Assistant Professor, D498, ESP.

Projects:

We have used paleolimnology to reconstruct airborne asbestos concentrations throughout the 20th century. Because asbestos is analyzed by electron microscopy, residual particles in lake sediments interfere with its detection. Hence one rotation project would be to improve asbestos extraction from lake sediments. This would utilize electron microscopy, density gradients, surfactants, ultra-centrifugation, and other methods that appear promising.

We have also investigated asbestos-contaminated vermiculite that has devastated a small mining town. We have found asbestos in tree bark near the mine at concentrations in the hundreds of millions of fibers per square centimeter. A rotation project focused on this research would be the characterization of subtle chemical differences among the asbestos fiber suite from these mines. This would utilize electron microscopy and elutriation methods. Laboratory-based. Mentor:

Xianliang Zhou, Ph.D., Assistant Professor, D524 (office) and D514 (lab), ESP.

Project: We are currently developing new techniques based on HPLC for the measurements of trace atmospheric species, including HONO, HNO₃, carbonyls, alcohols, NH₃, organic amines, H₂S and thiols. The student(s) will perform preliminary experiments during the lab rotation(s) to examine the feasibility of certain new methods for their applications in atmospheric measurements. These experiments, hopefully, will be developed into Ph.D. thesis research for one or two students in the coming years.
Laboratory-based study.

Mentor: **Lei Zhu**, Ph.D., Associate Professor, D421C (office), D414 (lab), ESP.

Project: Study the Photolysis of Formaldehyde on Ice Films.
Formaldehyde has been reported to release into the atmosphere from snowpack. It can undergo photolysis or reactions in the gas phase and on the surface of snowpack. Although formaldehyde photolysis on snow has been postulated to be partially responsible for CO production at the surface of snowpack, it is unknown what are its primary photodissociation products and quantum yields. To better understand snowpack chemistry of aldehydes, we plan to explore the photolysis of formaldehyde on ice films. This project is a new research direction of the group and it will be carried out in collaboration with Dr. Liang T. Chu. The student will be asked to review literatures on photolysis of molecules on ice films. He or she will be involved in the designing of a cell to be used in photolyzing molecules on ice films and detecting products using cavity ring-down spectroscopy. If time permits, the student will be involved in the preliminary study of the photolysis of formaldehyde on ice film at 308 nm excimer laser wavelength. The impact of using cavity ring-down spectroscopy to investigate aldehyde photolysis on ice film could be far-reaching. It is an innovative approach that can be readily extended to the study of the photolysis of other species on ice film. It may even permit us to develop sensitive probes to investigate surface photochemical reactions.
Laboratory based.

Environmental and Occupational Health Track

Mentor: **Irina Birman**, Ph.D., Assistant Professor, Research Scientist, Bureau of Public Water Supply Protection, Center for Environmental Health, New York State Dept. of Health, Room 400, 547 River Street, Troy, NY 12180, Tel.: 518-402-7650, Fax: (518) 402-7659.
E-mail: ixb02@health.state.ny.us

Project #1 Title: "Drinking Water and Public Health: Through Prevention to Protection".

This project will help students understand the impact of various environmental hazards (i.e. contamination of drinking water supply) on public health. Comprehensive coverage of fundamental principles, current practices and regulatory aspects related to drinking and waste water treatment will be provided. Site visits and tours will be organized to allow students observe different water treatment technologies, source water protection strategies, and water quality monitoring and control methods. By attending professional meetings, participating in site inspections, responding to public complaints and working with regulatory and scientific documents, students will develop an extensive knowledge of how regulatory agencies (state and federal) work collaboratively to protect public health.

Students will be introduced to an inter-agency 'network' comprised of US Environmental Protection Agency, New York State Dept. of Health, New York State Dept. of Environmental Conservation, County Health Departments, New York State Dept. of Agriculture and Markets, Soil and Water Conservation Districts, US Dept. of Agriculture, environmental and other groups/agencies involved in environmental protection. This project will be office and field based.

Project #2 Title "Drinking Water Treatment Technologies and Potential Public Health Implications":

By compiling an up-to-date scientific literature review, analyzing regulatory requirements and participating in laboratory experiments, students will expand their knowledge regarding the correlation between drinking water quality and public health, with emphasis given to the environmentally induced diseases. The toxicants of concern will include, but will not be limited to, disinfection by-products (i.e. THMs/HAA5) and coagulating agents (i.e. Aluminum-containing salts) that are used during/resulted from drinking water management activities. This project will include relevant site inspections/field trips (e.g. visits to water treatment plant(s), waste water treatment plant(s), etc.). Students' involvement in human/animal tissue culturing procedures and flow cytometry experiments is also anticipated.

The project will be laboratory, office and field based.

Mentor: **David O. Carpenter**, M.D., Professor, Director, Inst. for Health & The Environment, One University Place, B Wing, Room B242, Rensselaer NY 12144, Tel: (518)525-2660, -2661, Fax: (518)525-2665, EMAIL: carpent@albany.edu.

Students could do one of three different rotations in my lab. They are as follows:

1. Study of neurons, thymocytes or osteoblasts using flow cytometry to determine the effects of various environmental agents (metals, PCBs) on cell viability, ROS generation, membrane potential and other parameters, using appropriate fluorescent probes. This rotation would involve learning some cell culture procedures and preparation of cells from animals, as well as use of the flow cytometer.

Laboratory based.

2. Use of DOH databases (SPARCS, vital records, census) to study the incidence of disease in relation to residence near to hazardous waste sites.

This is not a laboratory-based rotation, but a good introduction to the kind of projects appropriate for EOH track students.

3. Electrophysiologic study of brain slice neurons to determine effects of environmental contaminants and study normal physiology of synaptic transmission. This is probably the least good rotation because it is very difficult to learn these techniques in a brief period of time. But students could at least observe, participate in experiments done by others and learn to make electrodes, solutions and prepare the brain slices for study.

Laboratory based.

Mentor: **David M. Dziewulski**, Ph.D., Assistant Professor, Bureau of Public

Water Supply Protection, New York State Dept. of Health, 547 River Street, Flanigan Square - Rm 400, Troy, NY 12180-2216, PHONE 518 402-7650, FAX 518 402-7659, dmd14@health.state.ny.us

Project 1: Use of a Zeta-Meter unit to particle studies involving protozoan cysts and oocysts. The unit is used to determine the electrophoretic mobility (EM) of colloid/particles in aqueous media. EM measurements of a colloid are performed under different pH, ionic strength and field strength conditions (anything from drinking water to sea water). The mobility data are then converted to Zeta Potential (ZP) and a “practical” expression of the electrostatic condition of the colloid in millivolts (+ or -). Work will be done to evaluate surface charges of inactivated protozoan (oo)cysts and surrogate particles.

Project 2: Aqueous Two-phase polymer system (ATPS) studies for the partitioning of Cryptosporidium oocysts and Giardiacysts into specific polymer phases. The partitioning activity is directly dependent upon the surface charge or hydrophobicity/hydrophilicity of the cyst or oocyst. A successful ATPS has been developed for Cryptosporidium oocysts. Additional evaluation of hydrophilic partitioning methods will be required with the specific aim of improving recovery by altering various ATPS components. In addition, an opportunity will exist to explore new polymers that require less partitioning time and room temperature conditions for separation to occur. Laboratory based.

Mentor: **Ying Wang**, Ph.D., Assistant Professor, Bureau of Environmental & Occupational Epidemiology, Center for Environmental Health, New York State Dept. of Health, 547 River Street, Flanigan Square - Room 200, Troy, NY 12180-2216
Phone: (518) 402-7990, Fax: (518) 402-7769, E-mail: wxy01@health.state.ny.us.

Project: Birth defects are the leading cause of infant mortality in the United States. Because the causes of about 70% of all birth defects are unknown, there continues to be concern about whether environmental pollutants cause birth defects, developmental disabilities, or other adverse reproductive outcomes. Utilizing the New York State Birth Defects Registry’s data, research projects need to be developed to investigate whether various occupational hazards, genetic and dietary factors, medications, and personal behaviors cause or contribute to birth defects. Students will be involved in all phases of the epidemiologic study including generating hypotheses, developing study proposal and design, conducting data collection, analyzing data, presenting research findings and preparing reports/research papers.
This project is office-based.

Mentor: **Lloyd R. Wilson**, Ph.D., Associate Professor, Section Chief, Special Investigations Section, Bureau of Toxic Substances Assessment, Center for Environmental Health, 547 River Street, Troy, New York, 12180-2216,
phone 402-7810, e-mail: lrw03@health.state.ny.us.

The rotation is a combination of field and office work for the Special Investigations Section in the Bureau of Toxic Substances Assessment. This group conducts indoor air investigations and is involved in two studies that require fieldwork. The investigations are commonly focused on indoor air issues related to contamination with petroleum, volatile organic contaminants such as the dry-cleaning solvent tetrachloroethylene, molds, mercury

and may include cases with poor indoor air ventilation. This work schedule is unpredictable, but typically there is at least one field investigation per week. The investigations may include collecting environmental data using field instruments, interviewing people, collecting samples for laboratory analysis, reviewing data from previous investigations and reviewing the ventilation of the building. The student would participate in these tasks as they arise with the site-specific investigations. Additionally, the section has two on-going research projects that include fieldwork. One is a study of the volatile organic compounds in homes with a fuel oil burner and the other is a study of the PCB concentrations in ambient and indoor air with PCBs. We expect to complete both of these studies by the end of October. The student will be afforded the opportunity to help with sampling for these projects.

Students will be required to write a report (typically 1 to 2 pages) for each investigation in which they participate.

Toxicology Track

Mentor: **Xinxin Ding**, Ph.D., Professor, E324, ESP.

Title: In vitro and/or in vivo drug metabolism in P450 transgenic/knockout mouse models

The aim of this project is to determine the role of P450 enzymes of a given tissue in the metabolism of drugs that are commonly used in clinical therapy, and yet have frequent adverse effects. In vitro analysis of drug metabolism will be performed using microsomal preparations from various tissues of P450 transgenic and/or knockout mouse models. In vivo drug metabolism will be analyzed through pharmacokinetics. The experiments will likely expose the student to a number of important techniques, including in vitro enzyme assays and enzyme kinetics; HPLC with UV, fluorescence, radioactivity, or mass spectrometric detection of drug metabolites; animal dosing and serum sample preparation; and pharmacokinetic analysis of drug disposition.

Laboratory based.

Mentor: **Jun Gu**, Ph.D., Assistant Professor, E622, ESP, Wadsworth Center
(518) 473-0782

Project: The overall goal of our research is to study human toxicology and environmental diseases using molecular approaches. One of emphases is on determining the role of cytochrome P450 reductase (CPR) in the pathogenesis of Alzheimer's disease (AD). CPR, a drug-metabolizing enzyme, has been known to be involved in the production of reactive oxygen species (ROS), and numerous studies have implicated oxidative stress in the pathogenesis of AD. CPR may contribute to the amyloid beta protein-induced neuropathology in AD through its activities in ROS production. We are testing our hypothesis by developing and utilizing a novel amyloid precursor protein transgenic mouse model with defective expression of CPR. This study will provide a better understanding of the molecular basis of pathogenesis of AD. In addition, we are also studying the role of cytochrome P450 enzymes in chemical toxicity in the kidney using conditional gene knockout approach. Kidney contains a variety of drug metabolizing enzymes and transporters, and is a primary target for numerous xenobiotic toxicants including drugs and environmental chemicals. A better understanding of the molecular mechanism of chemical-

induced renal toxicity will provide more effective methods for the prevention and clinical therapy of renal injury induced by xenobiotics.

Mentor: **Ellen Braun-Howland**, Ph.D., Assistant Professor, D672, ESP.

Projects are designed for students on an individual basis.
Laboratory based

Mentor: **Bruce Herron**, PhD, Assistant Professor, E419, ESP.

The Herron lab has a focus on developing model systems relevant to human disease that can be used to better determine gene/environment interactions and the basis of complex traits. In particular our group is currently investigating the genetic basis of differential blood vessel formation (angiogenesis) between distinct inbred mouse strains. This rotation project will focus on developing assays that will be used to specifically look at the contributions of endothelial cells to this phenomena. Techniques will include cell culture, tissue isolation from mice, and basic molecular biology (e.g. PCR, DNA isolation).

Mentor: **David A. Lawrence**, Ph.D., Professor, Office: C539, Lab: C419/422, ESP.

Four research projects are available in my laboratory of Clinical and Experimental Endocrinology and Immunology. Our focus is on immunotoxicology and neuroimmunotoxicology.

First, assessment of the mechanisms by which psychological stress alters immune responses, including host resistance against infections, via neuroendocrine mediators.

Second, investigation of autoantibodies to brain antigens, which induce neuropathy in diseases such as lupus, Parkinson's disease and Alzheimer's disease.

The third project involves the molecular mechanisms by which metals (arsenic, cadmium, lead, and mercury) and nanoparticles inhibit biosynthesis of important type-1 immunity (e.g., interferon-gamma production) which is a major cytokine responsible for cell-mediated immunity against intracellular pathogens and enhance type-2 immunity which is involved in allergies and asthma. Overall, the studies include biochemical, immunological and molecular analyses with emphasis on the molecular regulation of T-lymphocyte activation and generation of cytokines in the periphery and central nervous system.

The fourth project involves investigation of the genetic and environmental influences on biomarkers of stress. This project includes investigation of inbred strains of mice and humans and their sensitivity toward development of diseases that we hypothesize to have an autoimmune link such as autism.

Mentor: **Brian T. Pentecost**, Ph.D., Assistant Professor, E421, ESP
Phone: 518-474-2165, e-mail: brian.pentecost@wadsworth.org

I am working on several aspects of estrogen receptor expression and its regulation of other genes. There is continuing interest in estrogen receptor action and expression due to its role in development and in breast cancer. A variety of xenobiotics may have 'endocrine disruptor activity' due to their interaction with the estrogen receptor. I can offer several projects in this area.

We have identified, by gene array approaches, a group of genes as regulated by an estrogen receptor that lacks a DNA binding domain. One might take some of the genes and attempt to analyze their expression using RealTime PCR assays in the Roche LightCycler in order to better understand the bases for their regulation or the action of estrogenic xenobiotics. This methodology and the related software tools would be applicable in many of the labs in EHS.

A second project could relate to siRNA suppression of CYP1A1 and IB1 which are important in metabolism of estradiol and which are induced by the dioxins and other ligands of the aromatic hydrocarbon receptor. Researchers in our group find that dioxins have anti-estrogenic effects and consider this to be due to induced estrogen metabolism. Other labs have evidence for alternate anti-estrogenic mechanisms and our goal is the dissection of AhR-mediated actions. Laboratory based.

Mentor: **Richard F. Seegal**, Ph.D., Professor, Laboratory of Human Toxicology and Molecular Epidemiology, Telephone: 473-4378, E-mail: seegal@wadsworth.org, E209, ESP.

Project: The research carried out in my lab involves determining the consequences and mechanisms of action of developmental and/or *in vitro* exposure to environmental neurotoxicants. Current research projects involve determining the neurological sequelae of developmental exposure of laboratory rodents to: (i) complex mixtures of neurotoxicants found in contaminated foods and (ii) polychlorinated biphenyls (PCBs) and methylmercury (MeHg). Research techniques include (i) analysis of neurotransmitter concentrations in brain and tissue culture; (ii) analysis of changes in intracellular calcium and (iii) measurement of toxicant-induced changes in monoamine transporters that regulate intra both and extracellular concentrations of neurotransmitters. Laboratory based

Mentor: **Robert J. Turesky**, Ph.D., Associate Professor, E345 Biggs Laboratory, ESP.
Phone: 474-4151, E-mail: rturesky@wadsworth.org

Project: Heterocyclic aromatic amines (HAAs) are formed in cooked meats and tobacco smoke. Many of these chemicals are potent bacterial mutagens, carcinogenic in experimental animals, and believed to contribute to common forms of human cancers. Recently, we discovered a new class of HAAs in cooked meats. This proposed study is to investigate the formation, metabolism and genotoxicity of these newly discovered compounds. The project will use analytical instrumentation, high performance liquid chromatography (HPLC), UV diode array and mass spectrometric detection methods to identify these compounds and their metabolites using various xenobiotic metabolism systems. The student who takes on this

rotation, will learn how to isolate HAAs from complex food matrices, learn HPLC methodology, conduct enzyme metabolism studies, and be introduced to mass spectrometry detection methods. This is a laboratory-based project.

Mentor: **Qing-Yu Zhang**, Ph.D., Associate Professor (pending), E303, ESP.

Title: Genomic analysis of IE-Cpr-null mice

Students will perform genomic analysis of gene expression changes in a mouse model with intestinal epithelium-specific deletion of the NADPH-cytochrome P450 reductase gene (named the IE-Cpr-null mouse). The goal is to identify genes that are influenced by the loss of the reductase in the small intestine, possibly through disturbed homeostasis of endogenous signalling molecules or dietary chemicals that are normally metabolized by P450 enzymes in the small intestine. Techniques involved may include RNA preparation, PCR-based genotyping, microarray analysis, real-time PCR, immunoblot analysis, enzyme activity assays, and bioinformatics.

Laboratory based.

**ALL LABORATORY ROTATION FORMS
CAN BE DOWNLOADED FROM**

<http://www.wadsworth.org/sph/ehs/forms/index.html>

DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCES

STUDENT-FACULTY AGREEMENT FOR LAB ROTATIONS

**STUDENT - PLEASE FILL IN THE INFORMATION BELOW AND RETURN TO
DEPARTMENT OFFICE ESP C236**

NAME:

STUDENT I.D. NUMBER: _____

DEGREE PROGRAM: MS _____ Ph.D. _____

TRACK: _____

ROTATION MENTOR:

Lab Phone #: _____ Lab Room #: _____

Rotation Number: 1 _____ Semester: Fall _____ Year: _____

2 _____ Spring _____

Summer _____

Please note that EHS 690 contains **TWO** individual lab rotations. A student-faculty agreement sheet must be filled in for each of the rotations. You must return this sheet to **the department office** with the completed information **before the start** of each rotation.

LAB ROTATION MENTOR - Please fill in the information below:

LABORATORY ROTATION PROJECT TITLE:

Lab Rotation Mentor Name:

Lab Phone #: _____ Lab Room #: _____

Additional comments:

Faculty member approval to act as lab rotation mentor:

ehs\rotation.agr

(signature)

6) How well did the student interact with other people in the lab, socially and scientifically?

7) Additional comments.

Please check the rating which best summarizes the student's performance:

_____ SATISFACTORY: This is the expected and usual level of performance. The student generally meets performance expectations for all tasks and performs in a good and competent manner.

If Satisfactory, please circle one of the following:

A A- B+ B B- C+ C

_____ UNSATISFACTORY: The student clearly does not meet performance expectations for one or more tasks, not even at a minimally acceptable level. The student requires significant extra direction (taking into account any previous lab experience) and cannot be relied upon to perform experiments in a timely and effective fashion.

I have reviewed and discussed this evaluation
with the student.

I have reviewed and discussed this evaluation
with my rotation mentor.

Signature of rotation mentor *date*

Signature of student

date

**EHT 690 - Laboratory Rotations in Environmental Health Sciences
Course/Mentor Evaluation**

Session and Semester:

Name of Lab Rotation Mentor:

NOTE: This evaluation will be treated with the strictest confidence. Your remarks will not be communicated to the faculty member being evaluated. Complete this form and return it to the department office.

Evaluation of Rotation Mentor:

Rate the following questions on a scale of 1 to 5, using the key for that questions, in the spaces provided.

1) To what extent did the instructor provide you with the necessary education/training to carry out the laboratory work? 1,2 = less than adequate; 3 = adequate; 4,5 = more than adequate.

Rating _____

2) Were you provided with reasonably attainable, clearly-defined goals for your laboratory work? 1 = no; 2,3 = somewhat; 4,5 = definitely.

Rating _____

3) Was the instructor organized and prepared for your rotation?
1 = poorly organized; 2,3 = moderately well organized; 4,5 = very well organized and prepared.

Rating _____

4) Rate the helpfulness and availability of the instructor during the period of the rotation.
1 = gave no help; 2,3 = reasonably helpful; 4,5 = very helpful.

Rating _____

5) To what extent did the laboratory rotation broaden your base of knowledge?
1 = not at all; 2,3 = moderately; 4,5 = very much.

Rating _____

6) Was the work interesting?
1 = not at all interesting; 2,3 moderately interesting; 4,5 = very interesting.

Rating _____

7) How would you characterize the overall teaching performance of your faculty

instructor?

1 = poor; 2,3 = average; 4,5 = excellent.

Rating _____

- 8) Would you recommend a rotation in this laboratory to other graduate students?
1 = no; 2,3 = yes, with reservations; 4,5 = definitely.

Rating _____

- 9) Would you consider this mentor for your thesis or doctoral dissertation advisor?
1 = no; 2,3 = yes, with reservations; 4,5 = definitely

Rating _____

Explain:

- 10) Did the mentor provide enough time and help for you to prepare the rotation report?

1 = no; 2,3 = yes, with reservations; 4,5 = definitely

Rating _____

General comments

In the space below, please describe (a) what you liked best, and (b) what you liked least about this laboratory rotation.

Was there adequate time to have a productive rotation experience in one-half of a semester (7 weeks)? If not, how would you change it?

Was the preparation of a rotation report a useful experience? Explain.

Complete this page, separate it from the rest of the evaluation and return it to the department office

Rotation Coordinator Evaluation

Name of Rotation Coordinator: _____

Describe the adequacy of the instructions, advise and mentoring provided by the rotation coordinator.

Suggestions for changes or improvements in the way the course is handled.