NSERC CREATE Training Program
Human and Ecological Risk Assessment

www.usask.ca/toxicology/CREATEHERA
Canadians face an ever increasing number of potential health risks from environmental contaminants. Examples include lead in imported toys, bisphenol-a in household plastics, incidental ingestion of arsenic from mine tailings, and urban pollution from sources such as brownfield sites and automobile emissions. The government, scientists, and the public need to know the dangers that contaminated soil, water, air, foodstuffs, and consumer products pose to humans and the ecosystem and how to manage these risks to protect human and ecological health.

Assessing and managing risk requires a professional with expertise in public health sciences, environmental toxicology, and relevant Canadian laws and regulations. Until now, there has not been a comprehensive risk assessment training program that addresses all three areas. In fact, there is a large knowledge gap between the environmental sciences, public health sciences, and the law. Usually researchers from several disciplines acquire and study data used for risk assessment, but they are rarely involved with the entire risk assessment process (estimating, managing, and communicating the risk), and they rarely collaborate.

To address this knowledge gap, an outstanding group of Canadian experts have developed the NSERC CREATE Training Program in Human and Ecological Risk Assessment (HERA). This national, multidisciplinary program trains students to assess the ecological and public health risk posed by contaminants in our environment. The CREATE HERA program will produce a new class of professionals who understand the entire process of assessing and managing the entire process of risk assessment and management. It is also the first training program to explore Canada’s laws and regulations and the role of risk assessors within the legal framework.

A MESSAGE FROM
Dr. Steven Siciliano, Director of CREATE HERA
Training Program Objectives

The CREATE HERA program is for students interested in environmental health issues and who are already accepted in a MSc, PhD, or JSD program. It is designed to examine how toxicologists, lawyers, and public health professionals evaluate and manage risk.

The program can be completed in about 3½ years and consists of the following:

• Five academic courses
• A professional development course
• A yearly summer institute
• Optional research exchange
• A cooperative placement within industry or government

This program does not replace your existing graduate program. Whether or not the courses required by the CREATE HERA program count towards your PhD, JSD or MSc is at the discretion of your graduate committee. The CREATE HERA courses are meant to provide you with advanced technical training in Human and Ecological Risk Assessment so that at the completion of your degree, you will be well placed to transition directly into job opportunities within industry or government.
Late August—Students will gather for a week-long short course on the following:

**Human Health Risk Assessment for Chemicals in the Environment**

Covering theory and case studies, this course trains students to identify, collect, and critically analyze data pertinent to assessing human health risks posed by contaminants in the environment.

This course will cover the following topics:

- Theories and methods of risk assessment as practiced in Canada, and scientific issues and uncertainties being investigated in Canada and internationally
- Problem Formulation: outlining specific problems and most relevant issues for the particular situation
- Exposure Assessment: quantifying daily dose for critical receptor groups
- Hazard (toxicological) Assessment: defining the safe or tolerable dose by critical analysis of dose-response relationships in toxicological and epidemiological data
- Incorporation of new estimation approaches for low dose extrapolation
- Risk Characterization: comparing dose received to safe or tolerable dose and qualifying the significance of that result
- Background exposure and situation-specific exposures, and how these can be combined
- The application of probability theory to show how genetic, ethnic, geographic, and other factors affect risk assessment

September to May—Students will complete the following internet courses:

**Toxicology Risk Characterization**

This course gives students working knowledge of current processes and techniques for toxicological risk characterization. All components of the course involve critical analysis of the conceptual models for exposure and effects, quality control and selection of toxicity and exposure data, and relevance of the likely ecological effects. Students will prepare a project where they are to assess risk for a chemical based on exposure and effects data and considering current regulatory standards.

The objectives of this course are to:

- Introduce the concepts of ecological risk assessment endpoints, defining the problem, the conceptual model, and risk hypotheses
- Explore methods for measuring, estimating, and characterizing exposure for deterministic and probabilistic risk assessments
- Incorporate variance and uncertainty into risk assessment by combining characterization of responses at the organism and community level with exposures in deterministic and probabilistic procedures
- Discuss how data are applied in the decision-making process
- Demonstrate how to communicate risk findings in a professional setting

**Exposure Assessment**

This course explores how human and ecological receptors are exposed to contaminants, emphasizing how environmental fate models can be developed to identify critical exposure. Students will gain first-hand experience using modern exposure assessment modeling software to estimate exposure levels to human and ecological receptors.

The course will use case studies to illustrate the following topics:

- The interactions between humans and the environment and how contaminants are exposed to contaminants, emphasizing how environmental fate models can be developed to identify critical exposure
- The nature of agents, multi-media processes, fate modeling, and fugacity modeling
- Exposure pathways common to human and wildlife receptors (e.g., inhalation, ingestion, and dermal exposure), emphasizing the interplay between physiological and physical chemical processes in these pathways
• How tools such as the ATSDR Public Health Assessment Guidance Manual are used to demonstrate spatial-temporal community exposure pathways that in turn identify vulnerable populations.

**Regulatory Systems in Environmental and Health Law**

This course explores how the risk assessment process of sites and chemicals is regulated by environmental and health law. Using a case study approach, students will investigate the scope and diversity of Canadian laws relating to environment and health. These case studies will provide an overview and evaluation of how different regulatory regimes deal with risk, justice, and societal needs.

The course will address the following:

• How laws and risk assessment influence each other
• The basic structure, processes, and institutions of the Canadian legal system and the broader emergence and evolution of the regulatory state as it pertains to risk regulation
• Justice-based theories of the regulation of environment and health, including how they apply at various stages of the regulatory process (i.e., in legislatures, in regulatory agencies, by regulatory officials, and in the courts)
• Scientific characterization of risk compared to legalistic understandings of risk, with an emphasis on how risk is assessed and evaluated in relation to ecosystem and human health in both disciplines
• The relative merits of alternative approaches to regulatory governance, design, and administration, as well as the core principles that should inform regulatory development and reform; Students will be required to apply these principles to a regulatory problem that challenges them to propose and defend a solution while considering competing views of risk and justice

**Societal Dimensions of Risk**

Using theory and case studies, this course introduces students to many of the societal issues that impact on risk and its management, such as communication, perception, and First Nation knowledge frameworks. Because public perceptions of risk routinely drive political perspectives and the need or desire for regulation, professionals in this area require explicit training in how to meaningfully communicate and collaborate with stakeholders.

This course will address the following topics:

• Public perception of risk posed by chemicals and contaminated sites
• Risk communication to stakeholders directly interested, and often with vested interests, in the risk issue
• Community engagement and collaboration in risk assessment and management
• Collaborating with Aboriginal communities in the risk management process

**Summer Institute on Risk Assessment and Management with local SETAC chapter at Univeristy of Saskatchewan, Guelph, or Dalhousie**

Each year in early May, in association with a Society of Environmental Toxicology and Chemistry (SETAC) chapter for the participating university, we will host a Summer Institute on Risk Assessment and Management. All students will attend courses on risk communication, first-year students will present their case study results, and senior students will present research results to SETAC chapter members and the other students.

SETAC is an international organization of science-based professionals in academia, business, and government agencies working together to solve environmental issues. Because risk assessors and managers are usually SETAC members, students will have the opportunity to network with professionals in the field, who in turn will use the research generated by our students and likely employ them after they graduate. As well, by rotating our Summer Institutes through three SETAC chapter areas, students will develop a strong national professional network with risk assessment professionals.
September to May—Students will have the opportunity to participate in the following:

**Optional Research Exchange**

Beginning in the second year of the program, we will provide students the opportunity to work in a participating laboratory to acquire new research skills and knowledge. This study placement may not be suitable for all of our students and is therefore optional.

**Professional Development Course**

The professional development course will help students explore the role of communication, ethics, and leadership in a professional setting. Skills that will be studied include, but are not limited to, the following:

- Personal effectiveness skills, including personal and professional goal setting, problem solving algorithms, time and stress management, and creating an effective learning plan
- Communication and interpersonal skills, including building effective relationships, teams, and collaborations; understanding and engaging others; and ethical influence
- Creative and critical thinking, including strategic thinking and critical evaluation of ideas
- Leadership, including elements of leadership, characteristics and tools of effective leaders
- Research management, including resource acquisition, human resources, project management and administration, and accounting
- Societal responsibilities and ethics, including the role of research in society, responsibility of researchers to stakeholders, and legal and ethical considerations

*Summer Institute on Risk Assessment and Management with local SETAC chapter at University of Saskatchewan, Guelph, or Dalhousie*

See page 5 for a complete description of the Summer Institute of Risk Assessment and Management that is held each year in May.
Cooperative Work Placement

In the four- to six-month work placement term, students will gain private and public sector experience in applying environmental quality data to public health decisions. Our numerous contacts in consulting firms that perform this type of work (Stantec, AMEC, and Golder) have all indicated that they would be willing to have senior PhD students’ intern with them. However, we are only allowed to submit three letters of support from collaborators, so we only asked Golder to provide a letter. Within the public sector, applying environmental quality data to human health decisions occurs routinely within Health Canada, Indian and Northern Affairs Canada, and Environment Canada. Again, because we are limited to only three letters of support, we only requested letters from the SAFE Environments Directorate and the Pest Management Agency. All of these organizations have recognized the need for more trained professionals, and we should have no difficulty placing 10 students each year with them.

Summer Institute on Risk Assessment and Management with local SETAC chapter at University of Saskatchewan, Guelph, or Dalhousie

Each year in early May, in association with a Society of Environmental Toxicology and Chemistry (SETAC) chapter for the participating university (i.e., the Northern Prairie, Laurentian, and North Atlantic chapters), we will host a Summer Institute on Risk Assessment and Management. You will attend courses on risk communication, first-year students will present their case study results, and senior students will present research results to SETAC chapter members and the other students.

SETAC is an international organization of science-based professionals in academia, business, and government agencies working together to solve environmental issues. Because risk assessors and managers are usually SETAC members, students will have the opportunity to network with professionals in the field, who in turn will use the research generated by our students and likely employ them after they graduate. As well, by rotating our Summer Institutes through three SETAC Chapter areas, you will develop a strong national professional network with risk assessment professionals.
Support and Scholarships

The CREATE HERA program provides some participants with an annual $21,500 scholarship and a $2,500 travel grant to attend the yearly Summer Institutes and the academic short courses. Students who already receive NSERC, CIHR, or SSHRC stipend support will not receive CREATE HERA stipend support, but will receive the travel grants.

- An annual scholarship of $22,175 is provided for three years for PhD and JSD students and for two years for MSc students
- Additional $2,500 travel expenses will be covered to attend the short course in Human Health Risk Assessment at the University of Saskatchewan
- Moderate travel expenses will be covered to attend the Summer Institute on Risk Assessment and Management offered every May. (PhD and JSD students will receive travel grants for three years; MSc students will receive grants for two years.)

In return, the following criteria must be met:

- All five CREATE HERA courses must be completed within a two-year period with a final mark greater that 70%
- Each year that they are in the program, students must attend the Summer Institute on Risk Assessment and Management offered every May, where they will present their research subjects
- Students must apply for travel awards from their home university to help defray travel expenses associated with attending the Summer Institute
- Students must remain in their graduate program at their home institution

If any of the above is not met, your scholarship will be cancelled.

Admission requirements

The CREATE HERA program is open to PhD, MSc, and JSD students enrolled at a Canadian university. Before applying students must discuss this program with their supervisors. This program requies students to participate in the five courses and write exams

How to Apply – Application Deadline: June 1st of each year

To apply to CREATE HERA please send:

- A completed CREATE HERA application form
- A completed CV
- Official graudate transcripts
- A letter of acceptance into a PhD program
- A letter of support from your PhD supervisor indicating that (a) the research project you are working on is financially supported by sources other than CREATE HERA, and (b) the supervisor will attend the Summer Institute at least once during your tenure with CREATE HERA
- A letter indicating why you wish to enrol in CREATE HERA program. Include how your academic background has prepared you to understand the risk posed to human and ecological receptors by environmental contaminatants or, in this case of JSD students, the role of law and policy in addressing these risk assessments

For more information and to obtain application forms, contact the administration office at:

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