AGENDA

PRINCIPLES & PRACTICES OF BIOSAFETY

Monday June 1st – Friday June 5th, 2020

Location: University of Toronto, St. George Campus,
Address: EHS Training Room (Room 117), 256 McCaul St, Toronto, On, M5T 1S7
Campus Map: http://map.utoronto.ca/

Day 1: Monday June 1st, 2020 **Biosafety and Biosecurity Framework**	
3 hours	**Introduction to Biosafety and Biosecurity** Biosafety involves the consistent application of safety measures to minimize or prevent harm to laboratory personnel, building occupants, the public at large, the animal population, and the environment, resulting from exposure to infectious material, infected animals, or toxins handled in a containment zone. Biosecurity is protecting the population and economy from the intentional use of biological agents to cause harm or create fear. Learning Objectives • Risk assessment and risk group of biological agents • The development and administration of a biosafety and biosecurity program • Understanding biohazards and laboratory associated infections
1 hour	**Regulatory Requirements in Canada** **The use, import and export of biohazardous materials (pathogens and toxins) in Canada is regulated under:** • The Human Pathogens and Toxins Act (HPTA) • The Biological and Toxin Weapons Convention o Export Requirements for Biological Agents • The Health of Animals Act (HAA) • Plant Protection Act • Canadian Environmental Protection Act, 1999 • The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) • Transportation of Dangerous Goods (TDG) • Provincial Ministry of the Environment • Ministry of Labour • Municipal Government • Canadian Human Rights Act & Human Rights Code

	Learning Objectives • Understanding the framework of compliances and requirements by the different regulatory authorities and how to achieve them
2 hours	**From Biosafety to Biorisk Management** CWA 15793 Laboratory Biorisk Management standard was converted to ISO 35001 standard on biorisk management. This international biorisk management standard is based on a management system approach, which enables an organisation to effectively identify, assess, control, and evaluate the biosafety and biosecurity risks inherent in its activities. As such, this international standard is intended to define requirements for biorisk management that is appropriate to the nature and scale of any organisation. Biorisk management is built on the concept of continual improvement through a cycle of planning, implementing, reviewing, and improving the processes and actions that an organisation undertakes to meet its goals. Learning Objectives • Understanding the ISO 35001 Biorisk Management Standard • Learning how to establish the biorisk management principles that enable laboratories and related facilities to achieve their biosafety and biosecurity objectives • Understanding the essential components of a biorisk management system framework to be integrated into a laboratory or other related organisation's overall governance, strategy and planning, management, reporting processes, policies, values, and culture • Understanding the biorisk management process that mitigates biorisks (biosafety and biosecurity risks) • Providing guidance on the implementation and use of the standard.
1 hour	**Biosecurity in the Laboratory** This presentation is intended to provide a general understanding of biosecurity concepts, risk assessment, and biosecurity measures that can be implemented in the laboratory. Learning Objectives • Learning elements of risk assessment and hazard analysis • Learning the steps in developing a biosecurity plan • How to identify critical control points • How to address potential dual use of the research

Day 2: Tuesday, June 2nd, 2020 Biosafety in Disease and Infection Prevention – Part 1	
2 hours	**Blood Borne Pathogens** Blood borne pathogens are infectious microorganisms present human blood and primary tissues that can cause disease in humans. These pathogens include, but are not limited to, hepatitis B (HBV), hepatitis C (HCV) and human immunodeficiency virus (HIV). It is essential to understand the mode of transmission and how to prevent diseases by applying good biosafety practices. Learning Objectives • Understanding profile of prevalent viral pathogens • How to prepare protocols to mitigate exposure • What to do following exposure to BBP • Pre and Post Exposure Prophylaxis to BBP
1 hour	**CRISPR Biosafety** Genome editing (also called gene editing) refers to a group of technologies that give scientists the ability to change an organism's DNA. These technologies allow genetic material to be added, removed, or altered at particular locations in the genome. Several approaches to genome editing have been developed. A recent one is known as CRISPR-Cas9, which is short for clustered regularly interspaced short palindromic repeats and CRISPR-associated protein 9. Learning Objectives • Learn various applications of CRISPR • Understanding the biosafety and biosecurity concerns • How CRISPR can be used in human subjects • Non-human germline editing • Germline Editing and Gene Drives -- differences and local risk assessment
1 hour	**Prions Biosafety** Prion diseases or transmissible spongiform encephalopathies (TSEs) are a family of rare progressive neurodegenerative disorders that affect both humans and animals. They are distinguished by long incubation periods, characteristic spongiform changes associated with neuronal loss, and a failure to induce inflammatory response. Learning Objectives • Learning about prions related diseases • Understanding the unusual pathogen Prion Protein (PrP) • Stringent decontamination methods • Understanding prion blood borne transmission and required PPE

1 hour	**Zoonotic Diseases** Because of the unpredictable behaviour of animals and the potential for shedding of pathogens, working with pathogens in live animals could significantly increase the risk associated with any given procedure. Specific considerations should be given to the design of the facility and experiments for work involving pathogens and toxins with animals. Learning Objectives • Understanding animal characteristics related to biosafety concerns • Animal containment zone designs considerations • What is the unique infrastructure requirement? • How to handle and restraint animals to avoid contamination and injury
2 hours	**Viral Vector Biosafety** Viral vectors have become a fundamental tool among molecular biology researchers. It is important to understand how these tools came about and the potential implications of their use. Viral vectors are tailored to their specific applications, but most generally share a few key properties: safety, stability, cell type specificity and selection. Learning Objectives • How to identify lower and higher viral vectors • How to identify lower risk and higher risk research projects • Understanding the replication incompetency of viral vectors and why it can still be harmful • Learning about cell tropisms, the nature of transgenes, mutagenesis • Safety features -- reversion prevention

Day 3: Wednesday June 3rd, 2020 **Biosafety in Disease and Infection Prevention – Part 2**	
3 hours	**Infection Control: Pathogen Transmission in Clinical, Experimental, and Field Research** The purpose of this talk is to characterize the gray areas in biosafety for field studies and clinical settings. Developing creative solutions to solve unique problems not relevant in traditional laboratory settings. Real scenarios will be presented for discussion among participants. Learning Objectives • Overview of microbiological hazards in healthcare and field research settings • Considerations when assessing risk in these contexts

2 hours	**Medical Surveillance** The basic purpose of a medical surveillance program is to help prevent and detect illnesses related to exposure to pathogens or toxins. The program can include physical exams, laboratory testing, data analysis, x-rays, lung capacity and other medical tests. This presentation will provide methodology to determine, establish and streamline an effective medical surveillance program. Learning Objectives • What are the common biological hazards and prevention and controls • How to prepare a medical surveillance and pre/post exposure management program • Exposure assessment and decision making of post-exposure emergency actions • Risk assessment of biological exposure • Pre-placement and medical evaluation • Additional considerations for working with higher risk pathogens
1 hour	**Control of Microbial Growth** The principles of sterilization, disinfection, and decontamination are critical for reducing the risk of pathogen release within containment zones, to the environment, and within the community. Learning Objectives • Understanding the principles of sterilization, disinfection, and decontamination • Validation and verification of decontamination technologies and processes • Indicators, chemical integrators and parametric monitoring devices • Efficacy and monitoring sterilization, disinfection, and decontamination • Selection and validation/testing chemical disinfectants
1 hour	**Bio-Waste and other Hazardous Waste** Waste management is an integral component of a biosafety program, and comprises policies, plans, and procedures to address all aspects of waste management, including decontamination and disposal. Waste leaving the containment zone may be destined for disposal, movement or transportation to a designated decontamination area outside of the containment zone or transported off-site for decontamination via a third-party biohazardous waste disposal facility (e.g., incineration, steam sterilization). Learning Objectives • What are considered as biological waste • Designations of biological waste and exemptions • Standards for waste disposal • Waste facilities and storage of biological waste • Shipping, transporting and documentation

Day 4: Thursday June 4th, 2020 Engineering Controls	
1 hour	**Change Management** In today's fast-paced research environment, being able to adapt to change is essential. Within the research industry, legislations, technology, founding, conditions and requirements are always changing. As a result, an organization, should work to embed change management and build organizational capabilities. Learning Objectives • Creating consistency and efficiencies in approach • How to maintain up to date your biosafety and biosecurity program • Understanding the role of IBC when changes in the biosafety program is required
1 hour	**CL3 HVAC Systems** Ventilation systems for high containment laboratories are critical to prevent or control the exposure of lab workers, other persons and the environment to higher risk biological agents. Every CL3 laboratory has two physical layers of containment. The primary barrier (equipment), and the secondary barrier, the laboratory itself. The HVAC system must be designed to respond to the Canadian Biosafety Standard to provide a failsafe environment. This presentation will focus on the building mechanical requirements and change management practices to ensure compliance and safety. Learning Objectives • Understanding how HVAC interacts within the building • Special HVAC requirements for CL3 *in vivo* and *in vitro* • Commissioning and maintenance of CL3 HVAC systems • How to develop a change management program for CL3 labs
2 hours	**Engineering Considerations for Containment Laboratories** The physical containment requirements designed to mitigate the risks associated with handling or storing pathogens, toxins, infected animals, or other regulated infectious material. Physical containment is achieved through specific physical barriers provided by engineering controls and facility design. Learning Objectives • Understanding the concept of containment barrier • Controlling and securing access to facilities and safeguarding biological material • Surface Finishes and casework assessment • Air Handling and directional air flow

	• Facility services required in biological laboratories • What are the essential biosafety equipment
1 hour	**Biosafety Inspections** Workplace inspections drive the mitigation of incidents, injuries and illnesses. Through an in depth review of the laboratory, inspections help to identify risks and hazards and reveal non-compliance issues. A good inspection program is a key component of an integrated biosafety and biosecurity management program. Learning Objectives • Understanding the essentials elements of an internal inspection program • Learning the critical elements to review in a laboratory • How to plan and prepare for biosafety inspections • Types of hazards found in laboratories • Elements to include in a report
1 hour	**Biological Safety Cabinets** Biological Safety Cabinets, (BSCs), are designed to provide protection for personnel, the environmental and the product when installed and maintained properly and when appropriate working practices and procedures are followed. Learning Objectives • Understanding the limitations and capabilities of different class and types of BCSs • Understanding what causes turbulence and what affects the laminar air flow • Location and installation of BSCs • Proper testing and certification • How to demonstrate safe usage of BSCs
1 hour	**Personal Protective Equipment** Proper Personal protective equipment (PPE) use minimizes the risk of exposure to various hazards. PPE is the last line of defence to protect personnel and to minimize the risk of transmitting pathogens and toxins to the public and the animal population. Learning Objectives • Understanding the various types and selection of proper PPE (gloves, lab coats, eyewear) • Components of a respiratory protection program • Equipment certification and special protective equipment

Day 5: Friday June 5th, 2020 Administering your Biosafety and Biosecurity Program	
2 hours	**Emergency Response, from Planning to Recovery** It is critical that all laboratories, particularly containment zones address situations where biosafety or biosecurity issues may arise as a result of an emergency prior to starting work. Preparing an emergency plan specific to the research must be completed in advance to ensure that, when there is an emergency, lab personnel and emergency responders will know how to deal with the situation. Learning Objectives • Understanding the importance of an emergency response plan development and implementation • How to prepare a spill response for chemicals, biological agents • Assessment of exposure and how to prepare in case of exposure
1 hour	**Freedom of Information and Protection of Privacy** Biosafety professionals may have access to highly sensitive information e.g. intellectual property, personal health information, security sensitive information to perform their duties. It is critical that the information is filed/shared properly to protect it from misuse. Learning Objectives • Understanding the security and storage of information • How to prepare a proper documentation system • How to share sensitive information and maintain confidentiality and privacy
2 hours	**A Guided Tour to Laboratory Commissioning** Commissioning is a key component of the overall plan for the containment zone. During the commissioning process, a new or newly renovated containment zone undergoes an intensive quality assurance process that begins during the design phase and continues through construction and occupancy. The process is carried out by a BSO and technical or qualified personnel (e.g., architects; engineering technologists; heating, ventilation, and air conditioning [HVAC] system specialists; engineers) to confirm that the finished containment zone, equipment, and containment systems will operate in accordance with the design intent as well as the specifications in the CBS. Learning Objectives • Good general building layout • Understanding adequate infrastructure and building requirement • How to review compliance for surface coverings, equipment and furniture, sinks, location of Biological Safety Cabinets, location and requirement for emergency shower and eyewash

45 minutes	**Training Generation X, Y, and Millenniums** Every instructor can benefit from an understanding of how students learn and how generations differ in their learning. Recent knowledge in neuroscience, cognitive and developmental psychology has taught us about learning and how can we best apply these findings to improve teaching. Learning Objectives • What is known about student learning? • Emotional factors affecting learning • Applying the science of learning into the classroom
30 minutes	**Concluding Remarks and Course Evaluation**

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