Northwestern Directions in Safety
Mission Statement

The Office for Research Safety (ORS) adds value to the extraordinary teaching and research science of Northwestern University through its commitment to high standards and support services. ORS fulfills its commitment by systematically identifying hazards and controlling risks in the protection of individuals, public health and the environment. With guidance from University compliance committees, ORS provides the management and operational support for laboratory health and safety.

Finding reasonable and effective solutions to everyday health and safety problems—while striving to be consistent and helpful in all our activities—is an important priority for ORS. To renew and strengthen ORS for the future, we value the importance of education, training, certification, scholarship and involvement in our professional societies.

Extraordinary Science Done Safely

Michael Bryan Blayney, PhD
Executive Director
Phone: (847) 491-5581
michael.blayney@northwestern.edu

Ward Building, Room B-106
303 East Chicago Ave.
Chicago, IL 60611
(312) 503-8300, Fax: (312) 503-0547

Technological Institute, Room NG-71
2145 Sheridan Road
Evanston, IL 60208
(847) 491-5581, Fax: (847) 467-2797
Introduction

This report documents the redevelopment of the Office for Research Safety (ORS) at Northwestern University from the fall of 2012 until the end of 2015. It highlights many of the important changes that have occurred to improve services, raise safety standards, create new training and anticipate the future needs of science at Northwestern. In three years, ORS underwent major changes in organization, focus and services largely centered on a major effort to identify and remove historical, legacy wastes while setting higher standards for laboratory safety and hygiene.

As 2016 begins, ORS enters a new phase—looking beyond what we called the “Great Clean-Up”—toward realizing the capabilities of a new learning management system we call Learn@Northwestern and improving our oversight and business processes.

Our remarkable transformation is due in no small part to the willingness of the institution to change, the hard work of those mentioned in this report and the remarkable faculty, staff and students we serve.

From the small, everyday details we attend to (like container labels and clean lab coats) to the nuanced development of high quality training materials and qualified emergency response—ORS is fully committed to the goal of ensuring that extraordinary science is done safely.

“Northwestern is committed to excellent teaching, innovative research and the personal and intellectual growth of its students in a diverse academic community.”

— Northwestern’s Mission
With an internationally recognized medical school and multiple allied programs in the life sciences, biological safety (Biosafety) is a significant part of the ORS portfolio at Northwestern. With so many of our scientists involved in the biomedical and biotechnology sciences (often interdisciplinary), Biosafety is important ORS responsibility on both campuses. The Biosafety program at Northwestern must keep up with a myriad of rules and regulations from the NIH, CDC, DHS, OSHA, State and Local agencies.

Our Biosafety program encompasses Risk Group One, Two and Three agents, including recombinant and non-recombinant organisms, human blood and body fluids and tissues. The Biosafety program is also responsible for overseeing the management and disposal of biological waste on the Evanston and Chicago campuses.

In keeping with the redevelopment of ORS, our Biosafety Program underwent a “blue-ribbon” peer review (Summer, 2014), added highly qualified staff, developed new training courses and revised existing compliance programs. These important efforts are preparing us for the continued growth in the Feinberg School of Medicine. Our capable Biosafety staff includes two PhD scientists and a research trained DVM. Looking ahead, we are well positioned for the future.

In 2016 and 2017, our Biosafety program will begin a renewal cycle of activities to strengthen our Institutional Biological Safety Committee (IBC), further develop our close relation with the Animal Care programs and integrate with research programs of the Lurie Children's Hospital. It is an exciting time in the biomedical and life sciences and we look forward to continuing to serve, and improve how we serve, our faculty, staff and students.
BioSafety Quick Facts

- RECOMBINANT DNA PIs: 300
- HUMAN GENE TRANSFER PIs: 13
- BSL1, 2, & 3 PIs: 330
- BLOODBORNE PATHOGENS PIs: 250
- 2015 BIOWASTE (LBS.): 150,000
- IBC REGISTRATIONS APPROVED: 200

*Numbers for both campuses*
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<tr>
<td>ACTIVE PIs</td>
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<tr>
<td>UNDERGRADUATE &amp; HIGH SCHOOL STUDENT RESEARCHERS</td>
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Numbers for both campuses
The periodic inspection research laboratories and support spaces is a core function of the Office for Research Safety. The inspection process is essentially continuous on both campuses thanks to the work of our dedicated Laboratory Safety Specialists. Depending on the type of science and the hazards present, the frequency of inspection can be as often as every six months, typically once a year, or in some cases longer, if appropriate.

Physical hazards (electrical, thermal, pressure, clutter, etc.) are ubiquitous in all but the most benign laboratory environments. An effective laboratory safety program looks for the obvious (and not so obvious) physical hazards. At first glance, good housekeeping and facility maintenance are reliable indicators of well-controlled physical hazards and manageable risks. As we have improved our services, we have also raised our standards for laboratory housekeeping.

The use of chemicals is an important part of the teaching and research activities in laboratories on both campuses. Chemicals that pose potential risks to individuals, public health and the environment are considered hazardous and subject to significant regulation and costly disposal. Taken together, identifying chemical and physical hazards and controlling their associated risks are the foundation of laboratory safety. The presence of biological and/or radiological hazards adds additional elements to the oversight process (discussed separately in this report).

The Northwestern Direction emphasizes a “back-to-basics” approach. To achieve this goal, ORS coordinates the laboratory inspection process with allied services. Today we offer more convenient ways to recycle unwanted equipment, schedule industrial cleaning services, offer easy to obtain safety supplies and a completely revamped hazardous waste program. The collective change is evident on both campuses—cleaner labs, reclaimed space, improved safety practice, higher training rates and better services for our faculty, staff and students.
SAFETY STANDARDS FOR NORTHWESTERN UNIVERSITY
DEPARTMENT OF CHEMISTRY

REPORTING AUTHORITY:
- Any member of Chemistry Department who observes unsafe conditions, practices, or behaviors, specifically violations of these standards, must immediately inform the appropriate supervisor, AND the Office for Research Safety.

- All members of the Chemistry Department have the authority to stop or report any activity they believe to be unsafe for any reason, and at any time. If this is disputed, the evaluation should be immediately reported to the Office for Research Safety.

PERSONAL PROTECTIVE EQUIPMENT (PPE):
- While in a wet chemistry area, handling chemicals, researchers are required to wear a lab coat. The lab coat must either be 100% cotton or a flame-resistant (FR) lab coat. No lab coat should be worn in an office or area adjacent to a lab.

- Students, faculty, and staff are required to wear the proper type of safety glasses, gloves, or aprons while in the lab. This includes, but is not limited to, chemical splash goggles, safety shields, and appropriate lead safety goggles.

- Northwestern arterial supplies gloves—encapsulated in the hazardous material—must be worn while working with hazardous chemicals, gases, equipment, or processes.

LAB ORDERS/CLEANLINESS/INVENTORY:
- Only properly trained research staff must be kept inside the lab and regulated at all times. The Pimaasign is responsible for the upkeep of shared spaces.

- All waste, even small amounts, should be collected in the lab. Waste should be directed to a designated spill kit, and then removed through OHS.

CONFORMITY:
- Non-compliance with these safety standards is contrary to good practice of science, and subject to departmental and institutional oversight, including the possibility of sanctions.

- Fire extinguishers are located throughout the lab and are used for fire emergencies. They are easily accessible and marked with signs indicating their location.

- Work Safety is crucial in the lab environment, as accidents can lead to injuries and damage to equipment or materials.
Training Plays an Essential Role

Academic science is somewhat different from other research environments (industrial or governmental) insofar as we welcome, train and prepare students and postdoctoral fellows in a continuous two to five year cycle. Each year we welcome (and say goodbye) to approximately 20-30% of our clients—making training and education a vital part of how we create and sustain an evolving culture of safety at Northwestern University.

Over the past three years, we have developed and produced a number of short subject videos and e-learning programs using common media development tools. This “proof-of-concept” approach is only the beginning of a much more sophisticated future made possible by the Learn@Northwestern system (described in detail elsewhere in this report).

Over the next two years, the addition of creative staff and the opportunity to allow interested, talented staff across the Office for Research access to the knowledge, skills and tools needed to create new media will undoubtedly create an environment rich in the potential for lasting change and added value to science. We welcome this next step.

What Matters Most

Every day, ORS has the opportunity to help facilitate Extraordinary Science Done Safely in small ways (picking up a clean lab coat or container labels) to large ways (the safety education of future scientists or helping in the design of tomorrow’s research buildings).

In all cases, what matters most is a willingness to ask and deliver on a simple question—“What can we do to help?”

Nick Waddell, Senior Laboratory Safety Specialist (l) and Markus Schaufele, Director, ORS Evanston (r) prepare to inspect potential reactive containers.

Q. Jane Wang, Professor of Mechanical Engineering (l) and Jian Cao, Professor of Mechanical Engineering & AVP for Research (r) in the lab.
Campus Quick Facts

RAM PIs 64
LAB AREAS 163
X-RAY PIs 13
RAM WORKERS (includes Unit L & Unit H) 388
X-RAY WORKERS 270
LASER PIs 101
CLASS IIIB & IV LASERS >400
LASER WORKERS 431

Numbers for both campuses
The safe use of radioactive materials in teaching and research is based on a long-established set of principles, rules and regulations. Decades ago, stand-alone programs in Universities called “Radiation Safety” only focused on ionizing radiation. With changes in science and technology over the last twenty years, successful radiation safety programs elsewhere have evolved into a broader range of activities. At Northwestern, we are working to meet the needs of science today by the creation of a comprehensive “Health Physics Services” (HPS) program.

HPS is responsible for the safe use of ionizing and non-ionization radiation in its many forms—including sealed and unsealed isotopes, x-ray equipment, and high-energy lasers. No longer a stand-alone program, HPS works in cooperation with the biological safety, laboratory safety and hazardous waste programs in ORS. HPS is undergoing the same transformation as other ORS programs—third party audits, removing historical waste, new staff, staff training and improved services.

For our clients, the most noticeable improvements in HPS will appear in 2016-2017—reflecting further refinements in HPS services already in place or under development.

Like other ORS programs, updated and improved training is an important goal for HPS. New short subject videos on important topics are already giving HPS a fresh look—with entire new courses already in development or planned for the future. A new radiation safety “Basics” course will be available in the first half of 2016.

As HPS looks toward the future, documenting the historical use of radioactive materials in our teaching and research areas is also an important goal. HPS is developing the requisite knowledge and skills, along with specialized instrumentation, to document the impact of past practice on our buildings. This information will be valuable to Northwestern University for decades to come.
Northwestern University fundamentally changed its hazardous waste program in October 2012. Today, Clean Harbors Environmental Services provides well-qualified personnel, waste pick up, processing and disposal. For both campuses, their “Insight” program at Northwestern manages all forms of regulated waste — biological, chemical and radiological.

We also help facilitate the proper recycling of unwanted scientific equipment. In the near future, our Clean Harbors staff will have achieved their corporate “Best in Class” certification.

Hazardous Waste Services (HWS) in the Office for Research Safety (ORS) provides training in waste management, especially minimization, supplies (containers, absorbents & labels) and spill response.

HWS is committed to energy recovery (fuels blending) from our solvent waste streams and using “Best Available” disposal methods. Our program also provides industrial cleaning of laboratory fume hoods and cold rooms.

Today, we pick up and dispose of nearly twice as much regulated waste than before October 2012. After the “Great Clean-Up” that ended in August, 2015, we generate, collect and dispose of regulated waste over shorter periods of time, what we call our “New Normal” and a sign of an effective program.

HWS in ORS welcomes visitors—simply schedule a time.

HWS always welcomes waste management questions, comments and ideas.

Hemang Rana
InSite Program Manager; Clean Harbors Environmental

Michael B. Blayney, PhD
Executive Director, ORS; Clean Harbors Project Manager, HWS
FY 2015 Hazardous Waste: Type/Campus

**Evanston (69 tons)**

- Agarose Gel with EtBr: 1%
- Buikded Flammable/Corrosives: 7%
- Bulked Non-Hazardous: 5%
- Contaminated Lab Debris/Sharps/Glass/Vials: 18%
- Equipment Disposal: 2%
- Labpacks: 18%
- Oil: 4%
- Paint Waste: 0%
- Photo Fixer & Developer: 1%
- Other: 3%
- Non-Hazardous Waste: 3%
- Solvent Waste: 37%

**Chicago (29.5 tons)**

- Agarose Gel with EtBr: 6%
- Batteries & Bulbs: 1%
- Buikded Flammable/Corrosives: 5%
- Bulked Non-Hazardous: 5%
- Contaminated Lab Debris/Sharps/Glass/Vials: 6%
- Equipment Disposal: 2%
- Labpacks: 17%
- Oil: 0%
- Paint Waste: 1%
- Other: 0%
- Non-Hazardous Waste: 10%
- Non-Hazardous Waste: 24%
Embracing the New Normal

Hazardous Chemical Waste Disposal

Pounds

Blayney Arrives


2012 2013 2014 2015

Pounds

Chicago

Evanston

r2 = 0.22085

r2 = 0.23502

r = 0 - or approximately 39,000 lbs./quarter
Preparing for emergencies is an essential part of our work in ORS. It is also the basis of a critical relationship with our local communities. Working closely with University Police, ORS renewed its commitment in planning for the unexpected in our teaching and research laboratories in the fall of 2012. By last summer, we were ready to test our skills.

Time spent planning and training reduces the stress and potential confusion that inevitably occurs during the incipient phase of an actual emergency. Training with our local first responders also helps foster the trust, confidence and friendships that come from working together.

While it may seem counterintuitive, emergency response training actually strengthens safety and prevention efforts at Northwestern. Focusing on what may go wrong during training improves our prevention efforts, day-to-day.

In July of 2015, ORS, University Police, the Evanston Fire Department and hazardous materials technicians from the North Shore planned and carried out a comprehensive set of exercises over three days. Each day featured a different scenario that could potentially occur in a Northwestern laboratory. Each scenario had an emergency medical services component and a hazardous materials response element.

With the success of our 2015 drill, we are planning for the summer of 2016. For a look at some of the excitement last summer and our thanks to everyone involved, please visit https://vimeo.com/nuors

Katie Kollhoff, Safety Engineer
Shaun Johnson (l) Police Commander and Michael Blayney (r), Executive Director for Research Safety

Brett Berg (r) Health and Safety Specialist

Nicholas Waddell (l), Senior Laboratory Safety Specialist
NEW COURSES
Added since 2013

• Biological Safety
• Bloodborne Pathogens for CCM Workers
• Bloodborne Pathogens for Non-Research Workers
• Filling and Maintenance of Liquid Nitrogen Tanks
• Hydrofluoric Acid and Fluoride Ion Hazards
• Laboratory Reactor Pressure Vessels
• Respiratory Protection: APR
• Respiratory Protection: N95
• Respiratory Protection: PAPR
• Respiratory Protection: SCBA
• Working with Recombinant DNA

ORS Training Services

Training and education play a vital role in research safety at Northwestern University. Simply stated, it is the key to sustaining our gains and preparing for the future. If we do not develop new offerings for our current (and future) faculty, staff and students, then all that we achieved between the fall of 2012 and 2015 becomes a lost opportunity. To guard against this, we placed a high priority on expanding and improving our ability to produce training materials from the beginning. In addition, the completion of training is now an important element in the evolving laboratory safety review process.

Our approach in creating new material has two mutually reinforcing goals. First, to provide concise instruction, stated in behavioral terms, on our research safety program. The second goal is to impart health and safety knowledge that is useful in new situations and can remain relevant over a working lifetime. The first goal requires high quality training that is regularly updated. The second goal reflects the value of education—developing the knowledge, skills and abilities that can be applied at Northwestern today or elsewhere tomorrow.

In September of 2015, Northwestern University completed the implementation of powerful new learning management system (LMS) known as “Learn@Northwestern”. This cloud-based LMS system, tied to the key identity management systems of the University, has opened tremendous possibilities for the future. In 2016, ORS will continue to support our colleagues in the Office for Research in the further deployment of this system and more broadly with our colleagues in Human Resources to realize the potential of the system, campus-wide.
New Safety Training Modules

2013
NUFAB Cleanroom Procedures
Filling and maintenance of liquid nitrogen tanks

2014
HF and Fluoride Ion Hazards

2015
Lab Reactor Pressure Vessels

The size of the research population needing safety training continues to grow.

Our biggest project involved the transition from Blackboard to the University's new learning management system, Learn@Northwestern. This transition involved reformatting existing online courses, building the certifications, courses and classes in the new system and extensive user testing prior to launch.

In early 2015 we began using Vimeo to host safety training videos. These videos are available through our training courses and on our ORS website. We currently have 39 videos available; our videos have been loaded 4593 times since January.
Excellence in Higher Education Safety Training

\{Safety-Consortium.org\}

Creation of the Safety Training Consortium

The Safety Training Consortium is a higher education membership organization founded by research universities, for the purpose of developing safety training for the research community. The consortium operates under the auspices and confines of the University of California’s Center for Laboratory Safety.

As an academic group, we are driven by educational achievement and not profit. We enable metrics to evaluate our courses and provide institutional tracking. Stakeholders joining the Consortium include universities and colleges as well as industries with research interest across the country.

The mission of the Safety Training Consortium is to improve researcher safety by developing high quality, engaging and cross-certifiable safety training for the research community.

Online training modules are designed by System and Contributing Consortium members. Courses are owned by the Consortium. All members will have access to the entire course library and will benefit from regular updates based on customer feedback and regulatory changes.

Areas with currently available courses include:

- Laboratory Safety
- Chemical Safety
- Biological Safety
- Radiation Safety

CURRENT MEMBERS:
- California State University (22 campuses) | Emory University
- New Mexico State University | Northwestern University
- Princeton University | University of California (10 campuses)
- University of Pittsburgh | Washington University at St. Louis | Wellesley College

Michael B. Blayney, PhD
Founding Chair of the Board

Excellence in Higher Education Safety Training

\{Safety-Consortium.org\}
**Staff Accomplishments**

2012 - 2015

**ORS, EVANSTON**

*Brett Berg* is completing his MPH degree in Environmental & Occupational Health Sciences at UIC

*Cindi Mason* played a critical role in the implementation of Learn@Northwestern

*Gwen Sullivan* is a graduate of North Park University and future graduate student

*Iwona Spath* is preparing to take the Certified Biological Safety Professional examination

*Katie Kollhoff* completed the Professional Engineer examination

*Markus Schaufele* was appointed Director, ORS Evanston

*Nick Waddell* completed the Certified Safety Professional examination

*Wendy Ward* played a vital role in helping to rebuild our business model

*Anna Stasek* is a graduate of the University of Michigan (BFA) and recently joined us as an instructional designer

We said farewell to *Steve Karlman* who, after 25+ years of dedicated service to ORS, left Chicago to join his family in California. Steve also played a critical role in the implementation of Learn@Northwestern.

**ORS, CHICAGO**

*Andrea Hall, PhD* was appointed the Director of ORS, Chicago

*Angelica Gheen* received her Master’s Degree in Health Physics from Oregon State University

*Jose Macatangay* was appointed Radiation Safety Officer

*Joe Princewill* celebrated 25 + years of service to Northwestern

*Lauren Jones* is a graduate of the U of Illinois and future graduate student

*Lucy Galindo* has started her graduate studies in Public Health

*Luis Samaniego* completed the Associate Safety Professional examination and is preparing to complete the Certified Safety Professional examination

*Marina Zelivyanskaya, DVM* received a MS degree in Regulatory Science from NU & was appointed a Research Assistant Professor in Pathology, FSM

*Reginald Blythe* was appointed the Assistant Director of ORS, Chicago

*Robert Foreman, PhD* was appointed Associate Biological Safety Officer

*TJ Whittenhall* was appointed Laser Safety Officer