



Oregon Institute of
Occupational Health Sciences

2012-13

BIENNIAL REPORT

Our Mission

Your health doesn't exist in isolation from your work. The air you breathe, the food you eat, the quality of your sleep, your access to exercise, the likelihood of you succumbing to illness or injury—are all affected by your working life.

That's why we are here.

Since 1988 we have stood firmly at the intersection of the workplace and wellbeing. We are a nationally recognized team of scientists, and our work stretches from molecular-level research, to clinical studies, to field-tested programs in the workplace. We are dedicated to making a significant contribution to human safety, health and wellbeing.

At Occupational Health Sciences, we are integrating workplace safety, health and wellness programs, and we're creating actionable strategies to support the whole health of every worker. Together with our network of partners, we are setting the stage for a thriving workforce and better health in Oregon and beyond.

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A Message from our Director



2012-13 has been a significant period for our Institute and it gives me great pleasure to present to you our Biennial Report to cover this period. I joined the Center for Research on Occupational and Environmental Toxicology (CROET) in April 2012. Part of my task has been to assess all of our Institute's activities and expenditures, to encourage and support all of the valuable ongoing activities, to help identify and foster new opportunities and to increase collaborations with partners across campus, across Oregon and beyond to enable us to achieve our mission of promoting health and reducing disease and disability among workers across the nation, and particularly in Oregon.

First, I would like to announce a new name for CROET. A healthy workforce contributes to a safer and more productive workplace and minimizes health care costs. Through research, training and outreach, our Institute is improving worker health in Oregon. The prior name of the center emphasized only a small portion of the activities that we do. Thus, to better reflect our mission emphasizing total worker health, we sought legislative approval to change our name to the Oregon Institute of Occupational Health Sciences. This name took

effect on January 1, 2014.

Second, since the activities in our Institute are quite varied, ranging from performing state of the art basic and applied research, training health and safety professionals, providing toxicological consultations following exposures, and offering the public information on occupational health and safety, we have begun realigning these activities into problem-based thematic areas. This has enabled us to strengthen our collaborations in some areas, and to identify gaps that we are in the process of filling in other areas. The current thematic areas of research include: (1) Total worker health (2) Sleep and shiftwork: impact on health, safety and productivity (3) Exposure, its consequences and prevention (4) Strategies and solutions for vulnerable workers and (5) Injury, treatment, recovery and prevention. Using one theme as an example, we all recognize that adequate sleep is not only essential for our safety and productivity but also for our overall well-being and health. Sleep can be disrupted by stresses at home and work, lifestyle choices, by occupational constraints such as shift work, and by sleep disorders themselves – such as sleep apnea and insomnia. In our Institute, we are developing a research program to study all aspects of these large and common sleep problems and to implement solutions, ranging from screening for and treating sleep disorders, educating communities and workforces about 'sleep health', to implementing interventions designed to improve sleep, safety, productivity and overall health in the workplace. Similar to the other themes, this sleep theme spans basic research in animals, laboratory research in humans and applied

workplace interventions. All of these research endeavors complement each other, enhance the academic environment and lead to many fruitful collaborations.

Finally, I would like to thank R. Stephen Lloyd, PhD, who served as interim director of our Institute for two years. Our activities are supported from two main sources: state money from Workers' Compensation contributions, and the larger proportion from federal grants from the National Institutes of Health and other funding agencies. Over the past two years Dr. Lloyd expertly marshaled our Institute through a challenging time when it became increasingly harder to gain federal research support. Despite this challenge, at the end of that period our Institute emerged stronger with all faculty members receiving notable investigator-initiated funding from federal grants. I thank Stephen for his selfless commitment to our Institute and his significant research contributions, which remain a vital part of us achieving our mission. Stephen continues in a leadership capacity as the Associate Director of Basic Research in our Institute, where he is helping to refine our mission and increase interactions between the basic and applied sciences.

Our main activities, accomplishments and plans are described in the following pages of this annual report.

Respectfully submitted,

A handwritten signature in blue ink that reads "Steven A. Shea Ph.D." The signature is written in a cursive, flowing style.

Steven A. Shea, Ph.D.
Director

Occupational Health Sciences: a Resource for Oregon

The need for complementary basic and applied science has been an underlying tenet of the Oregon Institute of Occupational Health Sciences since its establishment as CROET in 1988.

The Oregon Institute of Occupational Health Sciences performs research at many levels, including basic laboratory science, human laboratory science, workplace interventions and outreach plus education. Current areas of research include: occupational exposures, their adverse effects and prevention; treatment, recovery and prevention of workplace injuries; total worker health; strategies and solutions for vulnerable workers; and the effects of sleep and shiftwork on health, safety and productivity. The Institute also participates in doctoral and postdoctoral educational programs to train the next generation of scientists.

Outreach is an important complement to research, because no research is worthwhile if the results are not published, announced or disseminated in a form useable in the workplace or for working people. Through its outreach efforts, Occupational Health Sciences serves as an information conduit



to Oregon workers, employers, labor, the general public, and provides updates for health and safety specialists to ensure the latest scientific advances are translated into enhanced workplace safety.

Our Areas of Emphasis

Education and Outreach

Occupational Health Sciences' Education and Outreach Programs have four goals:

- Provide scientifically accurate information on Oregon's occupational issues — continuously on the Internet and through the Toxicology Information Center (TIC)
- Offer educational programs on Oregon's occupational needs to health and safety specialists, government, and medical providers
- Train health professionals who will investigate Oregon's occupational safety and health issues in the future
- Provide scientific expertise to help Oregon industry and labor evaluate occupational safety and health questions

Research

Total Worker Health

Occupational Health Sciences faculty are developing, testing, and disseminating programs that integrate safety, health and wellness into single or associated programs that reduce injuries and improve wellness by reducing smoking, weight gain and work stress in workplace interventions.

Sleep and Shiftwork: Impact on Health, Safety, and Productivity

Adequate sleep is not only essential for safety and productivity but also for our overall well-being and health. We are developing a research program to study common sleep problems and to implement solutions, ranging from screening for and treating sleep disorders, educating communities about 'sleep health,' to implementing interventions designed to improve sleep, safety, productivity and overall health in the workplace.

Exposure: Consequences and Prevention

Occupational Health Sciences researchers use cutting edge science to characterize the adverse effects of occupational exposures, determine the mechanisms by which these exposures produce adverse effects, and apply that information to develop specific worker training and other innovative strategies to prevent the exposures and reduce the adverse consequences if exposures do occur.

Strategies and Solutions for Vulnerable Workers

Vulnerable workers, including young workers, agriculture workers and solitary workers, have special problems that may contribute disproportionately to Workers' Compensation costs. Institute scientists are developing unique programs to address their needs and prevent adverse consequences.

Injury, Treatment, Recovery, and Prevention

Physical injury is the largest contributor to workers' compensation costs in Oregon. To reduce this burden on worker wellness and productivity, Institute scientists are conducting innovative research on the causes, treatment, recovery, and prevention of workplace injuries.

2012-2013 Highlights

Occupational Health Sciences brings federal dollars into the Oregon economy

We receive base operations funding from the Oregon Workers' Compensation System, and we leverage these funds to obtain federal and other research dollars. For every dollar invested by the State's Workers' Benefit Fund in 2012 and 2013, our scientists brought an average \$1.70 and \$2.40, respectively, of federal grant funding into the Oregon economy. Federal dollars for research in Oregon have a significant positive impact

on the state's economy. Expenditures for goods and services, as well as the salaries of scientific and support personnel, produce a multiplier effect on the purchase of goods and services and creation of businesses that support the needs of Oregon's research institutions. Research coming out of the Institute can have a positive impact on the state's economy from new technologies and jobs that spin off from productive research.

Total Worker Health: Improving Workforce Safety, Health, Wellness and Wellbeing

The Oregon Healthy Workforce Center (OHWC), a National Institute for Occupational Safety and Health-Center of Excellence in Total Worker Health™, is an affiliation of Oregon Health & Science University's Oregon Institute of Occupational Health Sciences (OHWC home) and Health Promotion and Sports Medicine, Portland State University's Occupational Health Psychology program, the University of Oregon's Labor Education Research Center, Oregon State University's College of Public Health and Human Sciences and the Kaiser Center for Health Research.



The 2013 progress meeting of the OHWC staff.

OHWC faculty and staff are developing and evaluating Total Worker Health™ intervention programs that integrate safety, health, wellness and wellbeing into integrated or associated programs designed to reduce injuries and improve wellness. They accomplish this by increasing healthy eating and exercise and reducing work stress through workplace interventions. The OHWC serves as a resource for western states and supplements the other

Centers of Excellence in New England (Connecticut/Massachusetts), at Harvard and Iowa.

The OHWC's theme is intervention effectiveness using team-based and technology-based interventions to promote and protect health, and is designed to be disseminated broadly to the workplace. The OHWC's overarching conceptual model predicts that interventions will lead to changes in knowledge and psychosocial factors that mediate or moderate hazard reductions and behavior change. This will in turn produce hazard reductions, safer work behavior, improved lifestyle choices, and better psychological and physical health. The OHWC is the only Center focusing on intervention effectiveness, successfully conducting randomized trials of innovative interventions and adding value with a cross-study database (Data Repository) of common measures across projects.

The OHWC program consists of the following four research projects, two initially conceptualized as translational projects, educational programs and outreach that are interrelated.

Research Projects

Creating Health and Safety “Communities of Practice” for Home Care workers – Dr. Ryan Olson is using a peer-led scripted curriculum to organize home care workers into neighborhood-based teams that provide education and social support for improving lifestyle (e.g., diet, exercise) and safety behaviors. The program is named COMPASS (COMMunity of Practice And

Safety Support).

- In partnership with the Service Employees International Union Local 503 and the Oregon Home Care Commission, the Olson team developed and pilot-tested COMPASS.



- Pilot study team meetings were well attended (90% attendance), rated as enjoyable, and produced large knowledge gains. The intervention produced statistically significant improvements in well being, fruit and vegetable consumption, safety compliance scores and counts of specific safety actions in homes, including the adoption of new ergonomic tools (example shown here).
- During 2013, over 140 participants were enrolled in a randomized trial of COMPASS that includes measurement of health and safety factors at baseline, after 6 months, and after 12 months.

Safety & Health Improvement Program (SHIP) – Dr. Leslie Hammer (PSU) is training supervisors to use a team-based approach to restructure work processes to make them more efficient and support balance in employee’s work-family demands, thus reducing stress and improving safety and wellness in City of Portland construction workers. The intervention included a supervisor computer-based training component that focused on supervisor support for work-life and safety; a supervisor behavior tracking component to increase the transfer of the computer-based training to on the job behaviors; and a team-based component that involved facilitated sessions aimed at the reduction of low-value work within the work group to allow more time to encourage supportive behaviors related to safety and health.

- SHIP was delivered to 10 group supervisors and teams at the Portland Water Bureau and 12 groups at the Portland Bureau of Transportation in 2012.
- Following the intervention, 388 participants completed assessments of the effectiveness of the interven-

tion at 6 months and 336 participants completed the assessments at 12 months. In addition, 16 groups of controls received SHIP training in 2013.



- SHIP identified psychosocial risk factors and health and wellness outcomes within this population including the prevalence of injury, unhealthy levels of body fat, and at-risk blood pressure.

Health promotion intervention to reduce health risks among correctional officers (DOC) – Dr. Kerry Kuehl (OHSU) is using a 12-week team-based peer-led approach to improve lifestyle (e.g., diet) choices and safety (e.g., ergonomic issues) in corrections workers.



- 210 baseline risk assessments on correctional officers from the Oregon State Penitentiary, Oregon State Correctional Institute, Columbia River Correctional Institution and Santiam Correctional Institution were completed in 2012.

- Post-intervention testing in 2013 demonstrated significantly lower blood pressure, total cholesterol, percent body fat, and improved dietary behaviors among the intervention group as compared to the control group.



Safety and Health Promotion in Young Workers (PUSH) – Dr. Diane Rohlman is using internet-delivered training to foster healthy lifestyle choices and safe work practices in young summer workers in a Parks and Recreation department, and enhancing dissemination by using social media.

- In 2012, Dr. Rohlman conducted surveys with 210 Portland Parks and Recreation summer youth employees, developed online training for use on social networking sites (Tumblr, Facebook, Pinterest), piloted it with 700 young workers, and recruited 300 young workers into a randomized control trial.



PUSH Program

- In 2013, young workers who received the PUSH training significantly increased knowledge of safety and health immediately following training and at 2 months post-training. Reaction scores from participants who took the PUSH training indicated 59% of young workers “really enjoyed participating in the training” and 60% agreed that the training was “extremely useful for improving [their] health and safety.” Additionally, 63% reported changing one or more of their behaviors as a result of participating in the training program, and 67% agreed they would highly recommend the training to their coworkers.

Supervisor training to promote health/safety in construction (Latino+non-Latino) - Dr. Kent Anger is enhancing supervisor team building and training skills, supported by behavior tracking technology, to motivate their employees to adopt healthier lifestyle choices and safer work practices, in Latino and non-Latino supervisors in the construction industry.

- Funded in 2012, Dr. Anger developed the training and a structured 12-week approach to wellness for employees (pictured).



- Reactions to the wellness training were positive in 9 International Union of Painters and Allied Trades apprentices and improvements in several wellness measures and team cohesion were seen in the apprentices.

OHWC Pilot Projects funded in 2012 and 2013

Be Active, Work Safe: A Novel Program for People with a Disability – Drs. Laurel Kincl and Simon Driver (OSU) are working to improve the health and safety of workers with disabilities through the development, testing and dissemination of a web-based intervention that integrates basic occupational health and safety skills into an evidence-based health promotion model.

- experts and individuals with a disability evaluated the preliminary testing of content and delivery of the Be Active, Work Safe program. Based on the feedback, changes to the organization (e.g., participant progression through the program), layout (e.g., navigation), and content (e.g., behavior change activities) were made to better meet the needs of individuals with a disability in 2013.

Family-Supportive and Safety-Supportive Supervisor Behavior Training in Corrections Personnel – Dr. Charlotte Fritz is conducting a trial of a family and safety-supportive supervisor behavior training to reduce employee stress and increase employee work-life balance, well being, and safety and health behaviors in corrections personnel. This project was funded in 2013.

OHWC Outreach and Education

Outreach is provided through 1) traditional paper-based newsletters and annual reports that are also electronically available, 2) exhibits at 10-15 practitioner and scientific meetings per year, 3) blog, facebook and twitter postings, 4) CROETweb resource directory (~70,000 hits in 2013), 5) leading sponsorships of wellness conferences leveraging Oregon Institute of Occupational Health Sciences funding, to promote Total Worker Health™. Some of the highlights of our Outreach activities include:

- Held a Partner’s Luncheon in 2012 that drew over 130 registrants from diverse industries, government and labor addressing return on investment of wellness programs.
- In 2012-13, outreach coordinators Dede Montgomery and Steve Hecker brought major national/interna-



Dr. Kent Anger speaking at the Total Worker Health™ Partners' Luncheon

tional speakers on Total Worker Health™ (Ron Goetzel, Larry Chapman, Dov Zohar, Joseph Hurrell, Arla Day, Sandy Hershcovis, Steven Shea, Orfeu Buxton) to the OHWC Partners Luncheon, Occupational Health Psychology Summer Institute, and Symposia/webinars.

- Recruited 8 summer interns at the Oregon Institute of Occupational Health Sciences in first two years – the best applied research poster award was received by OHSU interns in 2012, 2013.
- In 2013 the OHWC presented a peer-reviewed symposium describing research projects and ongoing data

collection at the International Work, Stress, and Health conference in Los Angeles, CA.

- Presented invited seminars at regional Centers to increase visibility and understanding of Total Worker Health™ (University of Washington, Washington State University, WESTon).
- Presented invited seminars at other NIOSH Centers outside the West (e.g., Mountain and Plains ERC, NIOSH Cincinnati Total Worker Health™ Seminar series).
- Presented at National meetings to increase visibility of Total Worker Health™ (e.g., Work, Stress, and Health, American Public Health Association).

Collaborative Activities with Other NIOSH Total Worker Health Projects in 2012-2013

- Established connection with 2 NIOSH Total Worker Health Centers (New England, Iowa) to develop a multi-center total worker health collaboration intervention for emergency services and corrections workers.
- In 2013, a national conference on corrections research needs was planned with other Centers in New England and Washington state.

OHSU Let's Get Healthy! Program



Let's Get Healthy! is a popular education and research exhibit that travels around the state (and nation) to help the public learn about their own health and to collect data that is available for group analysis. Participants receive immediate personalized (multi-lingual) health feedback while their anonymous, linked health information becomes part of a population database available for use in support of school projects, community and workplace wellness policy decisions, and research opportunities. The program accomplishes this by providing an interactive, scientifically-based educational and research experience to schools, communities and workplace partnerships. In 2013, Let's Get Healthy!

- Held 15 events in Oregon and two in California where 4,718 people participated in the research study, and trained 328 volunteers to assist with the research study.
- Conducted 18 events in Oregon through lending library loans, reaching an additional 1395 Oregonians.
- Held two teacher professional development sessions (56 contact hours each) on 1) epigenetics and 2) data visualization for the classroom.
- Enrolled an additional 485 people in a longitudinal study of cardiovascular health in women.

Sleep and Shift Work: Impact on Health, Safety, and Productivity

Adequate sleep is not only essential for our safety and productivity but also for our overall well-being and health. It is well known that a tired person is more likely to be involved in an accident, have reduced motivation, poor mood, and strained relationships at home and at work. More recently it has become evident that there are more chronic diseases such as obesity, diabetes, hypertension and stroke among people who sleep less.

Unfortunately, sleeping too little is easy and sometimes hard to avoid. Sleep can be disrupted by stresses at home and work, lifestyle choices, by occupational constraints such as shift work, and by sleep disorders themselves – such as sleep apnea and insomnia.

With night-shift work, we try to fight our natural biological tendencies to remain awake when we are normally expecting to sleep, and to sleep when the body is designed to be most alert. These challenges can be large. But sleep disorders can be treated, sleep habits can improve, and workplace schedules and the internal body clock (the circadian pacemaker) can both be manipulated to improve the health and productivity of shift workers.

At Occupational Health Sciences, we are developing a research program to study all aspects of these large and common sleep problems and to implement solutions, ranging from screening for and treating sleep disorders, educating communities and workforces about 'sleep health', to implementing interventions designed to improve sleep, safety, productivity and overall health in the workplace.

In order to adapt to different shift work schedules, we need to understand how the body clock works, and how to reset the timing of the clocks in the brain and throughout the body so that we function optimally.

- By studying animals, Dr. Charles Allen and his research team are studying how the internal



Dr. Charles Allen (center) and his research team.

circadian pacemaker in the brain functions, and the neural mechanisms that govern re-setting this internal body clock.

- Dr. Doris Kretzschmar's research group uses fruit-flies (*Drosophila*) to study how circadian rhythms and genes that regulate the circadian system affect healthy aging and neural degeneration, typical of Alzheimer's disease.
- By performing laboratory studies in humans, Dr. Steven Shea is building on some of this animal research to determine the extent to which similar body-clock and sleep loss issues may help explain the adverse health effects of shift work.
- Dr. Matthew Butler is a new faculty member whose research is directed towards understanding the synchronization between environmental cues, the brain's 24-hour clock, and the clocks in other tissues like the heart and liver.



Dr. Matthew Butler

- Dr. Mitchell Turker's research group is examining how sleep loss

and circadian rhythms influence the changes in genes caused by the environment (epigenetics).

- Other Institute researchers, including Drs. Ryan Olson, Jackie Shannon and Kerry Kuehl (Institute affiliate), are translating these laboratory studies to perform monitoring and interventions onsite in a number of occupations. Specifically, they are examining the impact of work on sleep in nurses, truckers, information technology workers, and correctional officers, and are applying interventions to improve sleep, safety, and health in some of these groups.
- Finally, Occupational Health Sciences' Let's Get Healthy! Program is a popular interactive exhibit

used in the workplace, schools and community health fairs to educate people about many health issues, including sleep health. Let's Get Healthy! is also used for data collection in these groups to help with ongoing research.

Thus, Occupational Health Sciences is developing a research theme related to improving health, safety and productivity among workers by targeting sleep and shift work. This theme spans basic research in animals, laboratory research in humans, and applied workplace interventions. All of these research endeavors complement each other and improve overall likelihood of success in this area of The Institute's mission.



Some of the sleep and circadian researchers at the Oregon Institute of Occupational Health Sciences at OHSU. From left to right: Scott Holbrook, Charles Allen, Matthew Butler, Doris Kretzschmar, Steven Shea, Marlène Cassar, Noal Clemons, Sudeshna Dutta, Sally Roberts, Robert Irwin, and Nathan Klett. Not pictured: W. Kent Anger, Bonnie Bolkan, Olga Cravetchi, Lisa Marriott, Mykhaylo Moldavan, Ryan Olson, Jackilen Shannon, Elizabeth Sunderhaus, Saurab Thosar, and Mitchell Turker.

Exposure: Consequences and Prevention

Many occupational exposures that lead to adverse health effects are preventable or can be minimized. For example, we know that prolonged unprotected exposure to sunlight causes skin cancer, and that chronic exposure to toxic chemicals can adversely affect a variety of organs within the body. To reduce risks associated with such exposures, Institute researchers are using cutting edge science to:

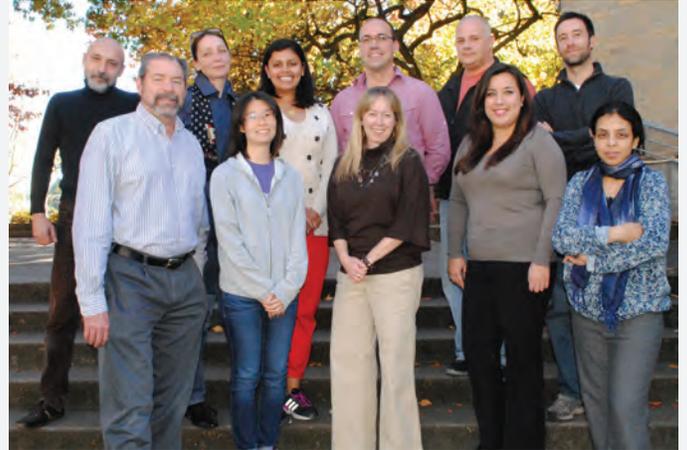
- Characterize the adverse effects of exposure.
- Determine the mechanisms by which these exposures produce adverse effects.
- Apply that information to develop specific worker training and other innovative strategies to help prevent the exposures in the first place and to reduce the adverse consequences if exposures do occur.

The role of exposure in cancer, aging and other diseases

Throughout life, humans are exposed in both their personal and occupational environments to ultraviolet light irradiation, ionizing radiation and a multitude of chemicals that can lead to debilitating diseases, including cancer. This area of investigation is the subject of two investigators in the Institute, Dr. Amanda McCullough and Dr. Stephen Lloyd. One part of Dr. McCullough's group studies how chemicals such as formaldehyde (which is used extensively in industry in Oregon) cause DNA damage and disease. Her research team has studied how exposure to formaldehyde produces DNA damage that manifests as chromosomal alterations that resemble those seen in certain cancers. Her group is probing the genetic basis by which cells respond to the formation of formaldehyde-induced DNA-protein crosslinks.

Dr. McCullough's group also leads a highly translational research effort that is designed to prevent skin cancers that arise as a consequence of sunlight exposure. This strategy relies on significantly enhancing the DNA repair capacity of the skin's most susceptible cell population such that these basal keratinocytes can rapidly repair the sunlight-induced damage and maintain a

healthy immune environment in the skin. Together with Dr. Lloyd's group, they are hoping to partner with clinicians at OHSU to treat organ transplant patients who are extremely susceptible to this form of cancer.



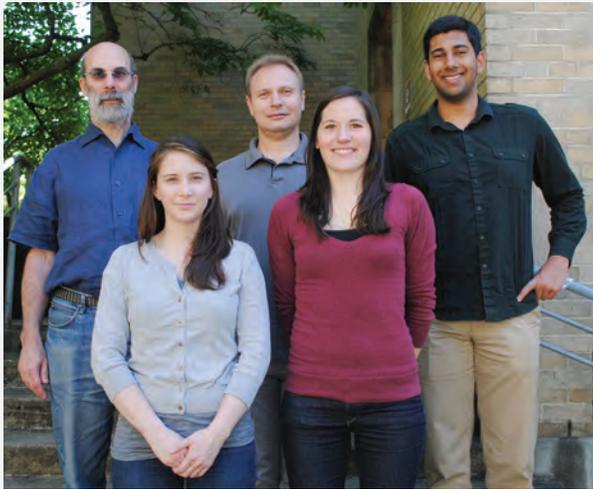
Drs. Stephen Lloyd (Left front), Amanda McCullough (center front) and their laboratory staff.

Dr. Lloyd's research group not only investigates how occupational chemical exposures affect human health, but also how drugs administered as part of therapeutic protocols also cause genetic damage. For example, many of the chemotherapeutic drugs that are used to treat cancers form the same type of DNA damage caused by industrial pollution and occupational toxicants. The Lloyd laboratory has shown these chemicals can cause DNA damage that, if not repaired, can lead to further genetic changes that further promote disease.

Dr. Lloyd's group also has discovered that oxidant stress which results in specific DNA damage can serve as a trigger for alterations in energy metabolism. They have discovered that changes in DNA repair mechanisms can significantly alter how the body processes caloric intake and can shift the metabolism toward a fat storage mechanism. These studies are providing novel insights into understanding the complexities of the ongoing obesity epidemic.

Mutagenesis is the study of how the function of genes can change due to alterations in the DNA sequence. In contrast, epigenetics is the study of how the function of genes can change even without changes in the underlying DNA structure. Environmental exposures can cause both mutational and epigenetic changes. Dr. Mitchell

Turker is researching the mechanisms by which such changes in 'gene expression' from these exposures cause disease. The Turker laboratory has:



Dr. Mitchell Turker (left) and his research group.

- Developed new approaches to demonstrate the mutagenic effects of exposure to ionizing radiation, such as from radon exposure or X-rays.
- Developed new assays that foster discovery of new drugs for the treatment of cancer and other diseases.
- Shown that low oxygen conditions and ionizing radiation exposures cause epigenetic changes.

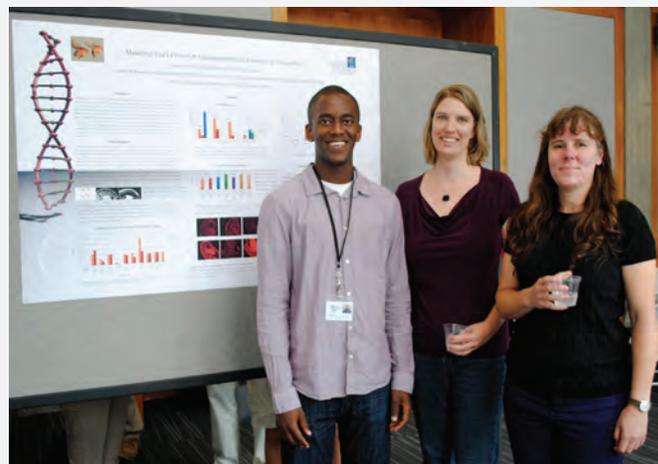
Agriculture contributes hugely to the Oregon economy. Pesticides are commonly applied to prevent crop losses, but exposure to high levels of many of these pesticides can damage the nervous system of humans and other animals – they are 'neurotoxic'. Drs. Diane Rohlman and Kent Anger are measuring the exposures and working to reduce or prevent adverse effects from pesticide



Dr. Dianne Rohlman (R) and her laboratory team.

exposure. They have demonstrated that:

- Repeated workplace exposure to the commonly used insecticide called chlorpyrifos can affect the nervous system based on tests of memory and attention. Dr. Rohlman's and Anger's research team quantified the relationship between the exposure level and this neurotoxic effect, i.e., the dose-response relationship. Chlorpyrifos now joins only six other human neurotoxicants whereby chronic or repeated low-level exposures have been shown to cause such neurotoxic effects based on behavioral testing.
- In parallel research, Dr. Doris Kretzschmar's team, using the fruit fly (*Drosophila*) as a model, discovered that the activity of certain proteins is reduced by exposure to a broad class of organophosphorus chemicals, like the pesticide chlorpyrifos.



Dr. Doris Kretzschmar (R) at the summer intern poster session.

Dr. Desire Tshala-Katumbay is advancing our understanding of toxicant-induced neurodegeneration through basic and global translational research; his research team has:

- Discovered the specific chemical structures within industrial hydrocarbon chemicals that induce neurotoxicity. These findings will aid the development of test methods for diagnosing and preventing chemically-induced neurological disease.
- Examined the neurotoxic effects of cyanide. Cyanide is a chemical used in many industrial settings, in

some warfare settings to which US military could be exposed, and occurs during digestion of some



Dr. Desire Tshala-Katumbay (upper left) conducting field work in the Democratic Republic of the Congo.

foods, such as the Cassava root. From studies in both Oregon and the Democratic Republic of the Congo in Africa, Dr. Tshala-Katumbay's team has determined the far reaching neurotoxic effects of exposure to dietary-derived cyanide, and they have examined how specific genetic differences between individuals results in different degrees of susceptibility to these neurotoxic effects. These studies will aid in the prevention and treatment of disease from exposure to a variety of industrial and other compounds with cyanide-like activity.

- Exploited the physico-chemical properties of neurotoxicants to develop a peptide-targeting system that is able to deliver small molecules selectively to neurons, thereby circumventing the hurdles posed by the blood brain barrier in the routine exercise of drug administration. The peptides may be injected intramuscularly.

Strategies and Solutions for Vulnerable Workers

Vulnerable workers, including young workers, agriculture workers and solitary workers, have special challenges that may contribute disproportionately to Workers' Compensation costs. Institute scientists are developing unique programs to address the needs of vulnerable workers and prevent adverse consequences. Workplace stressors, physical and emotional, as well as the threat of physical violence, are significant hazards to employee health and safety. These stressors can be particularly hazardous to solitary workers who face workplace hazards alone and without the support of co-workers. Dr. Kent Anger, in collaboration with Dr. Nancy Glass of Johns Hopkins University:

- Developed an intervention program to teach home care workers how to de-escalate potentially violent situations in the workplace. The program is being evaluated to determine the extent to which it can be extended and disseminated widely to workers in other occupations.

Dr. Diane Rohlman is interested in protecting the health and safety of vulnerable workers, including: agricultural workers, who are subjected to a variety of stressors, including physical and chemical hazards,



Dr. Kent Anger (R) and his research team

limited access to medical care, and seasonal variations in work-demand that lowers their sense of control in the workplace; young workers, who suffer twice as many non-fatal injuries at work than older workers due in part to their lack of training and assertiveness; and nail salon workers, the vast majority of whom are immigrants, who are exposed daily to a variety of chemical hazards. In 2012, Dr. Rohlman:

- Completed a pilot project examining workplace stress among farmworkers in Oregon.

- Conducted a survey of young workers to characterize their health promotion and workplace safety activities.
- Developed workplace safety and wellness activities to be used with immigrant and non-immigrant supervisors of construction workers. Methods were tested in electrician and painter apprentice programs.



Construction Worker Apprentice Project.

- Helped coordinate ongoing health and safety activities in collaboration with social service agencies and the Oregon Collaborative for Healthy Nail Salons on behalf of nail salon workers.

Dr. Ryan Olson is developing and testing safety and health interventions for solitary workers in demanding occupations, with the goal of reducing the unique hazards of isolated work, preventing injuries, and promoting health. Employees, such as truck drivers or home health care workers who work alone, are among the most at risk for on the job injuries.

In 2012-13, Dr. Olson:

- With funding from the National Heart Blood and Lung Institute (NHLBI), partnered with five trucking companies, including companies from Oregon and the Pacific Northwest, to launch the largest randomized controlled trial of a worker health intervention for truck drivers in U.S. history (over 450 drivers from 22 terminals were enrolled). The intervention program, named SHIFT (Safety & Health Involvement For Truckers), is hosted on a mobile-friendly website and involves competition, training, health coaching, and self-monitoring. Results of this trial will improve the overall health, safety, and wellbeing of people, like truckers, who work in environments with significant barriers to healthy eating, exercise, and sleep.



- As a member of the Oregon Healthy Workforce center (OHWC), developed a new team-based total worker health intervention for home care workers that may become a model program for dissemination to other states.



Home health care workers' meeting

Injury, Treatment, Recovery and Prevention

Physical injury is the largest contributor to workers' compensation costs in Oregon. In 2009, more than 48,000 Oregonians were injured on the job. Of those injured, 52.6% either lost multiple days from work, were placed on work restriction, or transferred to other duties. Nationally, the total annual cost for musculoskeletal disorders alone has been estimated to exceed 54 billion dollars. To reduce this enormous burden on worker wellness and productivity, Institute scientists are conducting innovative research to better understand:

- Causes of workplace injury, so the most effective strategies to prevent traumatic injuries can be developed.
- Effectiveness of treatments, to optimize returning injured workers back to full employment.
- Recovery from injury, which will enable development of new drugs and therapies to restore function to injured nerves and muscles.
- Prevention strategies to reduce injury frequency to eliminate as many injuries as possible.
- Continued to produce Annual Reports of fatality trends and abstracts, as well as in-depth fatality investigation reports for selected cases. In prior years 2010 and 2011, there were 50 and 59 work-related fatalities in Oregon, representing fatality rates per 100,000 workers of 2.8 and 3.3, respectively.
- Developed and field-tested new evidence-based guides that allow supervisors to present effective safety "tool box talks" to prevent occupational fatalities and reduce the risks that lead to them.
- Published their research, in collaboration with partners at the Oregon Health Authority, on elevated risk of workers over the age of 65 to be killed in transportation-related events. This included analyses of possible contributing factors such as older worker employment in hazardous occupations, as well as factors that could be targeted for intervention, such as the organization of work in small businesses.

Dr. Ryan Olson heads the Oregon Occupational Fatality Assessment and Control Evaluation (OR-FACE) Program, a National Institute for Occupational Safety and Health sponsored program designed to prevent occupational fatalities through surveillance, targeted investigation, assessment, and outreach associated with traumatic work-related deaths. In 2012-13, Dr. Olson and OR-FACE staff:

Neuromuscular injuries are an overwhelming cause of occupational disability nationally. Dr. Bruce Patton, who is interested in understanding how nerves and muscles develop and grow as well as respond to injury, has revealed previously unknown mechanisms of nerve and muscle cell development that may someday play key roles in establishing new therapies for restoring function in injured workers who would otherwise lose their ability to work. In 2012, Dr. Patton's laboratory has discovered:

- That a cell-adhesion molecule, known as CD44, is required for specific developmental stages of growth and differentiation in nerves and their support cells.
- CD44 is also required for normal growth and regeneration of small peripheral nerve axons.

These findings are enlightening our understanding of how nerves and muscles might be encouraged, through innovative therapies, to grow and regenerate after injury.

Chronic lower back pain is one of the most frequently encountered ailments of individuals during their working years, and research on the effectiveness of treatment is critical to reducing costs and improving overall worker health and productivity. Dr. Richard Deyo has a long-standing research interest in measuring patient function as it relates to the management of low back pain and has published a variety of influential articles on the effectiveness of various treatment modalities.

In 2012, Dr. Deyo:

- Examined the value of routine imaging in low back pain.
- Found that new guidelines for diagnostic imaging could actually improve outcomes, decrease risk, and reduce costs.
- Compared the efficacy of surgical approaches for treating back pain.
- Discussed complementary and alternative medicines to treat back and neck pain.
- Identified dangers of the growing use of opioids to treat back pain.

In 2013, Dr. Deyo:

- Co-chaired an NIH Task Force on Research Standards for Chronic Low Back pain, with recommendations to be published in 2014.
- Evaluated new technologies for treating spinal stenosis and vertebral fractures.
- Assessed the cost implications of complementary and alternative medicine (CAM) treatments for low back pain (e.g. acupuncture, massage).
- Evaluated the impact of prescribing narcotic painkillers for chronic pain.
- Identified complication rates among older adults having various types of spine surgery.
- Examined the influence of workers compensation coverage policies on rates, complications, and costs of spine surgery.



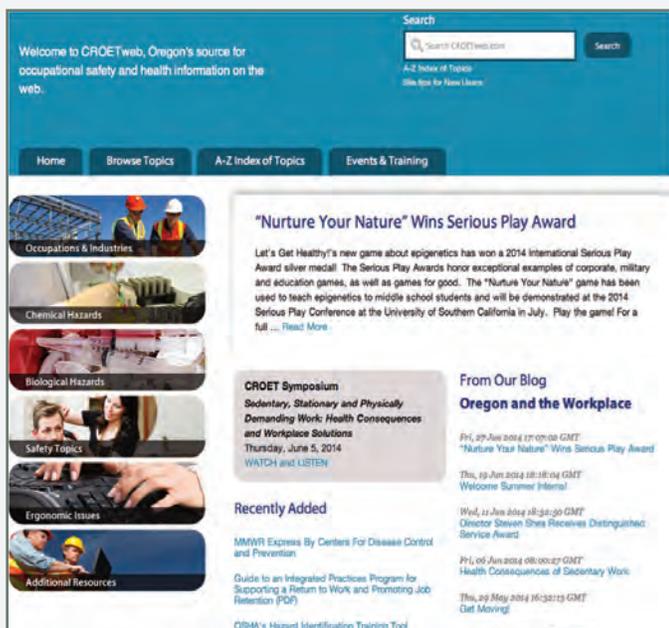
Dr. Richard Deyo (center) and his research team.

Outreach and Education

The Oregon Institute of Occupational Health Sciences is proactively engaged in providing timely occupational health and safety information to employees, employers, health and safety professionals, doctors, nurses, and the general public.

The Web: A Powerful Medium for Public Outreach

The Institute uses the full range of available web technologies to provide the public with the latest in health and safety information.



- CROETweb.com, Occupational Health Science's widely respected health and safety resource webpage, contains links to over 1,200 occupational safety and health resources focused on day-to-day workplace issues.

2012 total page views: 80,945

2013 page views: 63,000

Most widely viewed pages: safety and toolbox talks

- Our monthly e-newsletter keeps users up-to-date on happenings at the Institute as well as on new web content as it is added.

Issued monthly e-newsletters to approximately 1,000 Oregon stakeholders.

- Oregon and the Workplace blog.

Received 12,157 views in 2012 averaging 33 visitors per day, with each visitor spending an average of 4 minutes per visit. In 2013, just under 32,000 page views were received with viewers reading an average of three blogs per visit.

Oregon Institute of Occupational Health Sciences

- Twitter

The Institute currently has 250 followers on Twitter, including numerous international occupational safety and health organizations. Twitter "re-tweets" extend the Institute's message to thousands of new viewers.

- Facebook

As of 2013, the Institute has 130 "likes".

- Occupational Health Sciences website – where viewers can learn about the Institute, its people, research, and much more.

Total 2012 page views 32,382, 2013 page views 54,600

Most viewed pages: 1) summer students; 2) faculty pages; 3) emerging issues.

Health and Safety Training Symposia

Occupational Health Sciences provides at least two health and safety symposia per year, one sponsored jointly with the PSU Occupational Health Psychology program. Topics are determined based on feedback from the Oregon occupational health and safety professional community. The Oregon Healthy Workforce Center also sponsors a luncheon that includes talks by authorities in the Health and Safety/Wellness field. The target audience includes health, safety and environmental professionals, although the targeted group varies based on the symposium topic. The Institute presented the following symposia in 2012 & 2013:

Workplace Aggression: Causes, Consequences, and Prevention. Presented by Occupational Health Sciences and PSU Occupational Health Psychology, November 2, 2012.

Green Chemistry, Safer Alternatives and Work. Presented by Occupational Health Sciences and Oregon Health Authority, June 15, 2012.

Oregon Healthy Workforce Center Luncheon: An Authoritative Look at the ROI of Workplace Wellness Programs by Larry Chapman, September 14, 2012.

The Changing Employment Relationship and Worker Well-Being. Presented by Occupational Health Sciences and PSU Occupational Health Psychology Program, November 15, 2013.

Sleep and Shift Work: Impact on Health, Safety and Productivity. Presented by Occupational Health Sciences, June 14, 2013.



Green Chemistry, Safer Alternatives and Work
presented June 15, 2012

Creating Excellence in Worksite Wellness: Taking Your Program to the Next Level. A Short Course at the Oregon Governor's Occupational Safety and Health Conference, March 7, 2013. Co-sponsored by Occupational Health Sciences, the Oregon Healthy Workforce Center, SAIF Corporation and the Portland Business Journal.

Recordings of our symposia are available at the following URL (<http://www.ohsu.edu/xd/research/centers-institutes/croet/outreach/health.cfm>)

Health and Safety Conferences

The majority of health and safety conferences that the Institute participates in are sponsored by OR-OSHA. Conferences are an important means by which we reach out to working Oregonians: Workers and businesses learn about Occupational Health Sciences and what we have to offer, and Institute personnel learn about the needs and concerns of workers and the industries that employ them. Our scientists are often asked to give health and safety presentations in addition to providing conference exhibits. The Institute also created new stakeholders by attending conferences sponsored by other organizations, including the American Society of Safety Engineers and the American Heart Association Wellness Summit. Overall, conferences represent a tremendous networking opportunity for the Institute's outreach personnel, allowing us to travel to and meet Oregonians in all corners of the state.

Toxicology Information and Occupational Health and Safety Resource Centers

The Toxicology Information Center (TIC), directed by Dr. Fred Berman, and Occupational Health and Safety Resource Center, directed by Dede Montgomery, CIH, provide a vital service to citizens and professionals by

responding to their inquiries about workplace safety and hazards of exposure to chemicals and other agents. The goal is to provide up-to-date information in a form that is understandable and useful. Dr. Berman and Ms. Montgomery handle hundreds of consultation requests from occupational safety and health professionals, business owners, government agencies, physicians and nurses, the media, and the general working public. Inquiries cover a variety of issues. Chemical agents of concern include solvents, heavy metals, and pesticides. Physicians often seek information on a variety of potentially occupation-related health complaints. Each request takes from less than an hour up to several days to respond to fully. The TIC is open to calls from 7:30 a.m. to 5:00 p.m., Monday through Friday, and to walk-in visitors from 7:30 a.m. to 3:30 p.m., Monday through Thursday. Patrons have access to a variety of resources, including computers, databases, government reports, textbooks, and journals that are devoted to toxicology-related issues and occupational safety and health.



Fred Berman and Dede Montgomery

In addition to the TIC, Dr. Berman serves as consultant to the Oregon Department of Agriculture's Pesticide Analytical and Response Center (PARC), which is legislatively mandated to address pesticide-related incidents in Oregon that have suspected health or environmental effects (<http://www.oregon.gov/ODA/PEST/parc.shtml>). Dr. Berman is also a co-investigator with the National Pesticide Information Center (NPIC), a U.S. Environmental Protection Agency-sponsored project operated cooperatively with Oregon State University. NPIC provides objective, science-based information about pesticides and pesticide-related topics to enable people to make informed decisions about pesticides and their use (<http://npic.orst.edu/>).

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CROET Expenditures Fiscal Year 2011/2012

Workers' Compensation Expenditures		Federal and Other Grant Expenditures	
Salaries		Salaries	
Salaries - research (15% of all salaries)	620,358	Salaries - research (69% of all salaries)	2,884,698
Salaries - outreach (2% of all salaries)	90,956	Salaries - outreach (0% of all salaries)	0
Salaries - education (2% of all salaries)	62,445	Salaries - education (1% of all salaries)	33,051
Salaries - administration (10% of all salaries)	422,031	Salaries - administration (0% of all salaries)	0
Salaries - core services ¹ (1% of all salaries)	61,839	Salaries - core services (0% of all salaries)	0
Supporting Services (includes cores)		Supporting Services (includes cores)	
Supplies and equipment	439,013	Supplies and equipment	1,648,392
Miscellaneous support ²	109,753	Miscellaneous support ²	1,187
Outreach and Education		Outreach and Education	
Services, supplies and equipment	684,104	Services, supplies and equipment	0
Other Expenses		Other Expenses	
Bond principal & interest	353,481	Building operations & maintenance	0
OHSU administrative charges	0	OHSU administrative charges	261,434
Total	\$2,843,980	Total	\$4,828,762

Programs Fiscal Year 2011/2012

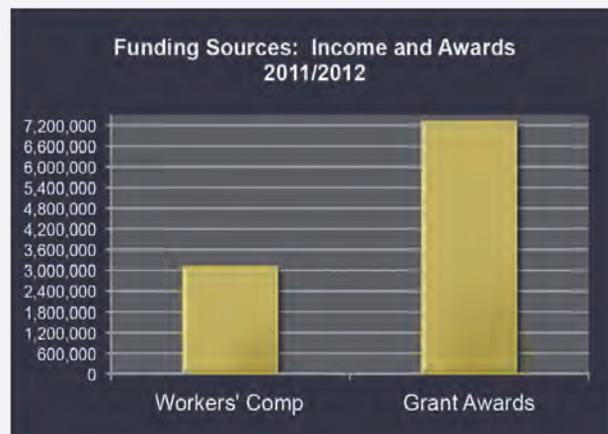
	Amount paid by W/C	Amount paid by grants	Total Cost
Outreach and Education			
Information dissemination (e.g., TIC ³ , website, newsletters, brochures)	745,776	0	745,776
Education & training programs (professional & para-professional)	91,729	50,637	142,366
Basic and Applied Research			
Factors that affect workplace performance	218,457	1,562,686	1,781,143
Damage and repair of the nervous system and muscle	215,571	297,850	513,421
Occupational/environmental exposures and their consequences	75,254	831,988	907,242
DNA damage, genetic alterations & disease	365,666	1,824,167	2,189,833
Core services support ¹	101,137	0	101,137
Non-program-specific expenses ⁴	1,030,390	261,434	1,291,824
Total Expenses	\$2,843,980	\$4,828,762	\$7,672,742

¹ core services - centralized graphics, statistics, and imaging

² e.g., equipment maintenance and repair, phone rental and line charges, office supplies

³ Toxicology Information Center

⁴ includes OHSU administrative charges, bond principal and interest, administrative salaries, building operation & maint and supporting services.



CROET Expenditures Fiscal Year 2012/2013

Workers' Compensation Expenditures		Federal and Other Grant Expenditures	
Salaries		Salaries	
Salaries - research (11% of all salaries)	484,053	Salaries - research (69% of all salaries)	2,942,946
Salaries - outreach (1% of all salaries)	61,920	Salaries - outreach (0% of all salaries)	0
Salaries - education (1% of all salaries)	36,527	Salaries - education (5% of all salaries)	207,128
Salaries - administration (9% of all salaries)	389,734	Salaries - administration (3% of all salaries)	121,093
Salaries - core services ¹ (1% of all salaries)	36,416	Salaries - core services (0% of all salaries)	0
Supporting Services (includes cores)		Supporting Services (includes cores)	
Supplies and equipment	362,213	Supplies and equipment	2,023,961
Miscellaneous support ²	90,553	Miscellaneous support ²	0
Outreach and Education		Outreach and Education	
Services, supplies and equipment	445,472	Services, supplies and equipment	
Other Expenses		Other Expenses	
Bond principal & interest	353,481	Building operations & maintenance	
OHSU administrative charges	0	OHSU administrative charges	80,964
Total	\$2,260,369	Total	\$5,376,092

Programs Fiscal Year 2012/2013

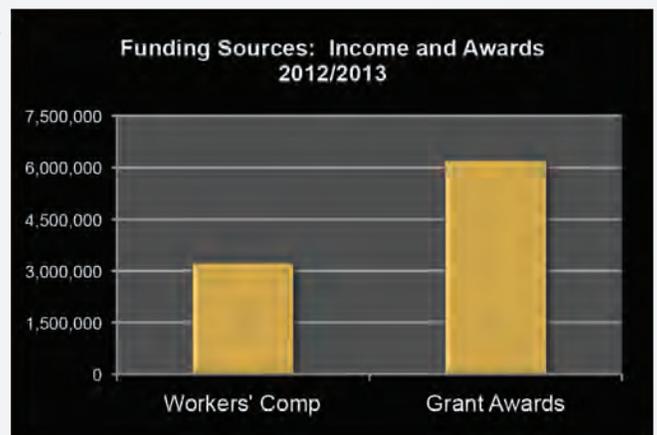
	Amount paid by W/C	Amount paid by grants	Total Cost
Outreach and Education			
Information dissemination (e.g., TIC ³ , website, newsletters, brochures)	416,318	0	416,318
Education & training programs (professional & para-professional)	127,601	329,144	456,745
Basic and Applied Research			
Factors that affect workplace performance	197,705	2,082,168	2,279,873
Damage and repair of the nervous system and muscle	149,515	390,666	540,181
Occupational/environmental exposures and their consequences	90,942	707,981	798,923
DNA damage, genetic alterations & disease	277,495	1,664,076	1,941,571
Core services support ¹	75,835	0	75,835
Non-program-specific expenses ⁴	924,958	202,057	1,127,015
Total Expenses	\$2,260,369	\$5,376,092	\$7,636,461

¹ core services - centralized graphics, statistics, and imaging

² e.g., equipment maintenance and repair, phone rental and line charges, office supplies

³ Toxicology Information Center

⁴ includes OHSU administrative charges, bond principal and interest, administrative salaries, building operation & maint and supporting services.



Grants Funded 2012-13

PI Name/Grant Title	Funding Agency
Charles Allen	
Calcium Signaling in Suprachiasmatic Nucleus Neurons	DHHS NIH Natl Inst of General Medical Science
Cellular Electrophysiology of the Suprachiasmatic Nuclei	DHHS NIH Natl Inst of Neuro Disorders & Stroke
Kent Anger	
Biomarkers of Organophosphorus Pesticide-Induced Neurotoxicity	DHHS NIH Natl Inst of Environmental Hlth
Partnership to Improve Workplace Safety for In-Home Care Workers	DHHS CDCP NIOSH via Johns Hopkins Univ.
Evaluation of the Oregon Protective Leave Law for Victims of Violence	DHHS CDCP NIOSH via Johns Hopkins Univ.
Oregon Healthy WorkLife Center	DHHS CDCP Natl Inst for Occupational Safety & Hlth
Sudeshna Dutta	
Effect of sleep and circadian rhythms on Alzheimer's disease model in Drosophila	OHSU-Layton Ctr for Aging and Alzheimer Research
Doris Kretzschmar	
SWS/NTE function in neurodegeneration and axonopathy	DHHS NIH Natl Inst of Neuro Disorders & Stroke
Kerry Kuehl	
Oregon Healthy Workforce Center	DHHS CDCP Natl Inst of Neuro Disorders & Stroke
R. Stephen Lloyd	
Chemistry and Biology of Carcinogen - DNA Adducts	DHHS NIH NIEHS via Vanderbilt Univ.
T4 Endonuclease V Structure-Function Analysis	DHHS NIH NIEHS
DNA Repair Deficiency Associated with Obesity and the Metabolic Syndrome	DHHS NIH Natl Inst of Diab & Digest & Kid Diseases
Inhibitors of DNA Polymerase Kappa	DHHS NIH Natl Inst of Mental Hlth
Cellular responses to DNA-protein crosslinks	DHHS NIH Natl Cancer Inst
Enhancement of DNA Repair Capacity Following UW Irradiation	DHHS NIH NIEHS via Restoration Genetics
Amanda McCullough	
Cellular responses to DNA-protein crosslinks	DHHS NIH Natl Cancer Inst
Ryan Olson	
Portland Center: Work Life Network Phase II	DHHS NIH Natl Inst for Infectious Diseases via Portland St Univ
Oregon Worker Illness and Injury Prevention Program	DHHS CDCP NIOSH via OHA Health Services, Public Health Division
Social Support During a Randomized Trial of a Trucker Weight Loss Intervention	DHHS NIH Natl Heart, Lung, and Blood Inst
Oregon Healthy Workforce Center	DHHS CDCP Natl Inst for Occupational Safety & Hlth
Bruce Patton	
Laminin mechanisms controlling axonal sorting	DHHS NIH Natl Inst of Neuro Disorders & Stroke
Diane Rohlman	
Fetal Exposure to Environmental Toxicants and Child Outcome	DHHS NIH Natl Inst of Child Hlth & Human Dvlp via Wayne State University
Oregon Healthy Workforce Center	DHHS CDCP Natl Inst for Occupational Safety & Hlth
Development of a Work Stress Survey for Farmworkers	DHHS CDCP NIOSH via Univ. of Washington
Harini Sampath	
The role of the DNA repair glycosylase NEIL 1 in the maintenance of mitochondrial function and metabolic homeostasis	American Heart Assoc., Western States Affiliate
Jackie Shannon	
Dietary Histone Deacetylase Inhibitors in Prostate Cancer Prevention	DHHS NIH Natl Cancer Inst via Oregon State Univ.
Sulforaphane: A Dietary HDAC Inhibitor and Prevention of DCIS Progression	DHHS NIH Natl Cancer Inst
Comparative Mechanisms of Cancer Chemoprevention	DHHS NIH Natl Cancer Inst via Oregon State Univ.
Statins and Prostate Cancer Recurrence	DHHS NIH Natl Cancer Inst via Kaiser Foundation Research Institute
What's the Chance? Learning and incorporating student perceptions and knowledge into the SBCE modules	DHHS NIH Natl Ctr for Research Resources via Univ. of California, Davis
CHIDR Chatter: Translating community research data for classroom use	DHHS NIH Office of the Director
Improving adolescent awareness of the epigenetics of generational nutrition	The OHSU Moore Institute
Steven A. Shea	
Chronobiology of cardiovascular and pulmonary disease	DHHS NIH Natl Heart, Lung, and Blood Inst
Desire Tshala Katumbay	
Toxicodietary and genetic determinants of susceptibility to neurodegeneration	DHHS NIH Natl Inst of Environmental Hlth
Mitch Turker	
Comparative Analysis of Charged Particle-Induced Autosomal Mutagenesis in Murine Tissue and Cells	Natl Aeronautics and Space Admin (NASA) via Univ. of California, Berkeley
A Mouse Model for Dietary Effects on Epigenetic Silencing	DHHS NIH Natl Cancer Inst
The Relation Between Mutagenesis and Genomic Instability After Particle Exposure In Vivo	Natl Aeronautics and Space Admin (NASA)
Interdisciplinary Center on Epigenetics Science and Society	DHHS NIH Natl Human Genome Rsch Inst

Oregon Institute of Occupational Health Sciences

The Oregon Institute of Occupational Health Sciences conducts research, trains health professionals, provides consultation, and offers the public information on hazardous chemicals and their health effects. The Institute includes scientists and research staff exploring a range of questions relating to prevention of injury and disease, and promotion of health, in the workforce of Oregon and beyond. The Toxicology Information Center (TIC) answers Oregonians' questions about chemical and other occupational exposures, and the Institute's web site, CROETweb, makes health and safety information available 24 hours a day.

How to Contact Us

Mail Address

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503-494-7366

E-Mail

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For additional copies of this report, call the Institute at the numbers listed.

Institute Personnel 2012-2013

(Hire-Retire dates in parentheses)

Director and Senior Scientist

Steven A. Shea, PhD (2012-present)

Associate Director of Basic Research and Senior Scientist

R. Stephen Lloyd, PhD (2003-)

Associate Director of Applied Research and Senior Scientist

W. Kent Anger, PhD (1989-)

Assistant Director for Operations

Gregory Higgins, PhD (1992-2013)

Assistant Director for Business Affairs

Janice Stewart, BS (1989-)

Faculty

Charles Allen, PhD (1990-)
W. Kent Anger, PhD (1989-)
Gregory Higgins, PhD (1992-2013)
Doris Kretzschmar, PhD (2002-)
R. Stephen Lloyd, PhD (2003-)
Amanda McCullough, PhD (2003-)
Irina Minko, PhD (2003-)
Harvey Mohrenweiser, PhD (2006-2013)
Ryan Olson, PhD (2005-)
Bruce Patton, PhD (1998-)
Diane Rohlman, PhD (1992-)
Jackilen Shannon, MPH, RD, PhD (2006-)
Peter S. Spencer, PhD, FRCPath (1987-)
Daniel D. Tshala-Katumbay, MD, PhD (2002-)
Mitchell Turker, PhD, JD (1996-)
Steven A. Shea, PhD (2012-)

Secondary Faculty

Richard Deyo, MD, MPH
Philippe Thuillier, PhD

Investigators

Robert Irwin, MD, MPH (2002-)

FRONT COVER

Oregon Institute of Occupational Health Sciences faculty and staff (Director Steven Shea in front)

Scientific Staff

Daniel Austin, MS (1989-)
Frederick Berman, DVM, PhD (2001-)
Michael Buck, PhD (2011-2013)
Bonnie Bolkin, PhD (2008-)
Marcus Calkins, PhD (2011-)
Summer Carter, MSPH, CCRP (2010-2012)
Parvathi Chary, PhD (2012-2012)
Mandy Cook, PhD (2005-2013)
Sudeshna Dutta, PhD (2012-)
Kendra Evans, MPH (2010-2013)
Paige Farris, MSW (2006-)
Dmytro Grygoryev, PhD (2009-)
Scott Holbrook, PhD (2011-)
Aaron Jacobs, PhD (2012-2013)
Jamie Jones, MPH (2012-2013)
Khalid Khan, PhD (2011-2012)
Richard Kleinschmidt, PhD (2012-)
Anuradha Kumari, PhD (2007-)
Naima Laharnar, Dip. Psychology (2009-)
Mike Lasarev, MS (1996-)
Lisa Mariott, PhD (2010-)
Michael Moldavan, PhD (2001-)
Dede Montgomery, MS, CIH (2004-)
Amy Palma, RD (2006-)
Megan Parish, MPH (2011-)
Harini Sampath, PhD (2009-)
Vladimir Vartanian, PhD (2003-)
Bradley Wipfli, PhD (2008-)
Robert Wright PhD (2011-2013)
Erika Zoller, MS (2007-2012)

Oregon Institute of Occupational Health Sciences

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Oregon Health & Science University includes the Schools of Dentistry, Medicine and Nursing; OHSU Hospital; numerous primary care and specialty clinics; multiple research institutes and several outreach and public service units. OHSU is an equal opportunity, affirmative action institution.

