

HazCom: Out with the Old, In with the New

It seems as though we have been talking about Global Harmonization for such a long time. And now, with the publishing of Federal OSHA's final rule "HCS/HazCom 2012" in March, the time has come!

Federal OSHA modified its Hazard Communication Standard (HCS) to conform to the United Nations' Globally Harmonized System of Classification and Labeling of Chemicals (GHS). OSHA concluded that the improved information will enhance Chemical Hazard Communication ("Right to Know" law) and make it more effective. By using internationally recognized pictograms (see illustration on page 2), labels¹ and safety data sheets², it is believed that the standard will allow more effective communication of chemical information to workers, reduce trade barriers and improve productivity in American businesses. Here's a summary of the major changes in the law:

- Hazard Classification (provides specific criteria for health and physical hazards, as well as mixtures)
- Labels (manufacturers and importers required to provide labels with signal word, pictogram and hazard and precautionary statements)
- Safety Data Sheet (requires a specified 16-section format)
- Information and training (employees must be trained on new labels and safety data sheets by December 1, 2013)

In early September, Oregon OSHA held its public hearing on the proposed rule. If you missed the hearing, it was recorded and you can watch it³ or read more about the proposed rule⁴ by visiting the OR-OSHA website. Oregon OSHA also produced an excellent special Hazard Communication Issue in its October 15 Safety and Health Newsletter (<http://www.orosha.org>). Changes will be mostly identical to the federal rule except as they relate to a few substance-specific standards that differ from Federal OSHA's rules. Key changes in both Oregon OSHA and federal OSHA's HCS/HazCom 2012 include:

- Labels to require standardized signal words, pictograms and precautionary statements.
- The "Material Safety Data Sheet" of yesterday will be a "Safety Data Sheet" with a standardized format.
- Hazard Classification definitions, particularly those of flammable and combustible liquids.

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Although there are many new dates as to when different parts of this law are effective, most employees will be required to be trained on new labels and safety data sheets by December 2013. Trainings on Haz Com 2012/GHS have already been held at the Central Oregon Occupational Safety & Health Conference (9/19-20/2012), the Southern Oregon Occupational Safety & Health Conference (10/16-18/2012), and the Western Pulp and Paper Workers Safety & Health Conference (Nov. 27-30, 2012). There is still a chance to attend training sessions at the 2013 Oregon Governor's Occupational Safety & Health Conference (March 4-7, 2013). Additionally, many organizations, including SAIF, are providing training and webinars to their policyholders. Check them out and move in with the new!

Hazard Communication Standard Pictogram

As of June 1, 2015, the Hazard Communication Standard (HCS) will require pictograms on labels to alert users of the chemical hazards to which they may be exposed. Each pictogram consists of a symbol on a white background framed within a red border and represents a distinct hazard(s). The pictogram on the label is determined by the chemical hazard classification.

HCS Pictograms and Hazards

Health Hazard  <ul style="list-style-type: none"> ■ Carcinogen ■ Mutagenicity ■ Reproductive Toxicity ■ Respiratory Sensitizer ■ Target Organ Toxicity ■ Aspiration Toxicity 	Flame  <ul style="list-style-type: none"> ■ Flammables ■ Pyrophorics ■ Self-Heating ■ Emits Flammable Gas ■ Self-Reactives ■ Organic Peroxides 	Exclamation Mark  <ul style="list-style-type: none"> ■ Irritant (skin and eye) ■ Skin Sensitizer ■ Acute Toxicity ■ Narcotic Effects ■ Respiratory Tract Irritant ■ Hazardous to Ozone Layer (Non-Mandatory)
Gas Cylinder  <ul style="list-style-type: none"> ■ Gases Under Pressure 	Corrosion  <ul style="list-style-type: none"> ■ Skin Corrosion/Burns ■ Eye Damage ■ Corrosive to Metals 	Exploding Bomb  <ul style="list-style-type: none"> ■ Explosives ■ Self-Reactives ■ Organic Peroxides
Flame Over Circle  <ul style="list-style-type: none"> ■ Oxidizers 	Environment (Non-Mandatory)  <ul style="list-style-type: none"> ■ Aquatic Toxicity 	Skull and Crossbones  <ul style="list-style-type: none"> ■ Acute Toxicity (fatal or toxic)

More HCS/GHS Resources:

Federal OSHA: <http://www.osha.gov/dsg/hazcom/index.html>

HCS/GHS Final Rule: <http://www.osha.gov/dsg/hazcom/ghsquickcards.html>

CROETweb Topic: HazCom & GHS Society for Chemical Hazard Communication:
<http://www.schc.org/>

CROETweb Topic: HazCom, MSDS's & GHS links:
<http://www.croetweb.com/links.cfm?topicID=25>

Diane Rohlman Takes Position at University of Iowa

Diane Rohlman, CROET Staff Scientist, will be leaving us -- mostly. Diane has been recruited to the University of Iowa as an Associate Professor in the Department of Occupational and Environmental Health in the College of Public Health. She's taking Khalid Khan, postdoctoral researcher, with her to begin a great new adventure. Diane will retain a part-time position in CROET to continue her research with Young Workers, a project in CROET's Oregon Healthy Workforce Center. We'll see her periodically, and we wish her luck in her new position.



Diane Rohlman and Khalid Khan

CROET Scientists Develop New High-Throughput Assay to Search for Novel Anti-Cancer Drugs

Human health and risk for disease ultimately depend on the integrity of our DNA, the genetic material that provides the body's blueprint for manufacturing proteins that carry out the function of cells and organs. Changes in DNA during life are believed to trigger cancer and many other chronic diseases. Such changes can result from exposure to certain chemicals found in the workplace and others in the diet and medications, and to sunlight in outdoor workers. CROET research on DNA is focused on the mechanisms that can lead to prevention and therapeutic strategies for reversing DNA damage relevant to the workplace.

Scientists from the CROET laboratory of Stephen Lloyd, in collaboration with other scientists from OHSU, the National Institutes of Health, the University of Arkansas and Vanderbilt University, have developed a high-throughput drug-screening assay to find a new class of novel anti-cancer drugs. The results of this work were detailed in a pilot study published in the October 2012 issue of the open access journal, PLoS One. The problem addressed in this study is that cancer cells frequently develop resistance to commonly used cancer drugs. What is novel about the new screening assay is that it can identify chemicals that inhibit this drug resistance and thereby restore the cancer-killing efficacy of those drugs.



Stephen Lloyd

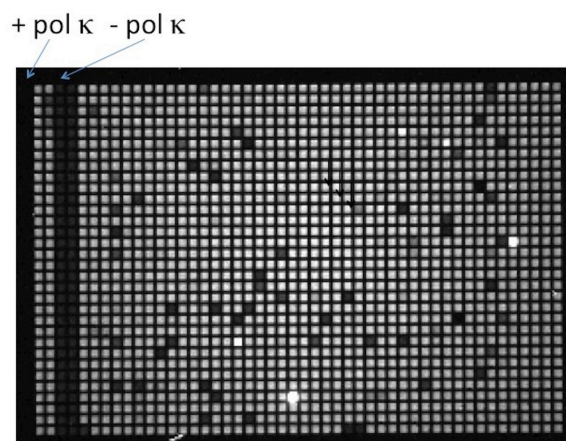
Many cancer drugs kill tumor cells by activating a pre-programmed cell suicide mechanism known as apoptosis. They do this by creating chemical bonds, or cross-links, between the double-stranded DNA that comprises chromosomes. DNA cross-linking interferes with a variety of processes that are vital to cellular function, including DNA replication and cell division. When DNA replication is inhibited, the cancer cells cannot reproduce and are induced to die by apoptosis.

So, how do cancer cells become resistant to anti-cancer drugs? It is a process known as trans-lesion DNA synthesis (TLS), mediated by a DNA replication enzyme called pol κ . Pol κ is able to replicate DNA in the presence of DNA cross-linking, thereby allowing cancer cells to survive and reproduce. Although TLS is an essential process for normal cells to survive limited genotoxic stress, the ability of pol κ to bypass DNA cross-links can limit the efficacy of cancer drugs. Therefore, drugs that inhibit pol κ may reverse the resistance of cancer cells to these chemotherapeutic agents.

Gliomas are the most common form of primary brain cancer and at present are usually incurable in humans because they are highly resistant to chemotherapy, leading to median survival of patients with high-grade gliomas of only one year. Importantly, the amount of pol κ is increased in gliomas, and its level is highly correlated with the grade of disease and the prognosis for cure. Thus, the identification of inhibitors that target pol κ may be crucial for improving the clinical outcome in glioma patients.

The assay developed by the Lloyd lab is actually quite simple. Moreover, it is conducted in a system comprised of 1536 tiny petri dishes, or wells, pictured here, which allows hundreds of prospective pol κ inhibitors to be tested per assay. In each well is a fluid medium holding a specialized length of double-stranded DNA containing a fluorescent marker. When pol κ is introduced, it replicates the DNA and consequently displaces and releases a segment of DNA containing the fluorescent marker. When released, the fluorescent marker is activated and the well glows. If a prospective pol κ inhibitor drug, also introduced into the test well, is active against pol κ , release of the fluorescent marker is prevented and the test well remains dark. Therefore, a potentially useful drug is one that prevents fluorescence from appearing.

Using this new assay, the scientists tested a library
(“CROET Scientists” Continued on p. 5)



1536-well Pol κ assay plate. Test wells in which Pol κ is inhibited appear dark in color.

Inaugural Partners' Luncheon

The Oregon Healthy WorkForce Center held it's first annual Partners' Luncheon in Portland on Friday, September 15th. Over 125 people attended to hear keynote speaker Larry Chapman of the Chapman Institute in Seattle (<http://www.chapmaninstitute.net/>) present "An authoritative look at the ROI of worksite wellness." He described the evidence basis for the high return on investment (ROI) of workplace wellness programs measured in dollar savings to the organizations. In a conservative meta-analytic review (<http://content.healthaffairs.org/content/29/2/304.full.pdf+html>) of 22 published, scientifically rigorous studies: \$3.27 was saved in medical costs and \$2.73 was saved in absenteeism costs for every \$1.00 spent on wellness programs. In a broader sample of studies published by Mr. Chapman, the overall savings were greater. The slides are available on the Oregon Healthy WorkForce website (see link below).



Larry Chapman and Kent Anger.



The first annual Oregon Healthy Workforce Center Partners' Luncheon drew a large crowd.



After the talk, registrants rolled up their sleeves and answered questions posed by the Healthy WorkForce Center, including what should be measured in intervention studies to improve "Total Worker Health" (Occupational Health & Safety and personal wellness) being carried out by the Center and what are the best ways to motivate people to change or improve their safety, health and wellness behaviors. The photos in this article show the groups at work.



Larry Chapman facilitates breakout group.

Among the attendees were representatives from Labor, Industry (construction, diverse services, manufacturing, health care, transportation), Government (state, county, city), Academia (all large Oregon universities), and K-12 education.

For more information about the Oregon Healthy Workforce Center, visit <http://www.ohsu.edu/xd/research/centers-institutes/croet/oregon-healthy-workforce-center/index.cfm>

of almost 16,000 bioactive molecules at 7 different concentrations and identified 60 prospective “hits” for further validation as pol κ inhibitors. Three of these 60 were selected as proof-of-principle compounds and further characterized for their specificity toward pol κ . Although the three compounds selected would, for a variety of reasons, not ultimately be candidates for new anti-cancer drugs, the strategy for finding such drugs was validated in this pilot study. This study has moved the research effort one step closer to the development of pol κ -targeted novel cancer therapeutics. The next step in the process is to expand testing to a larger molecular library of over 400,000 compounds.

For more information about the laboratory of Dr. Lloyd, please visit <http://www.ohsu.edu/xd/research/centers-institutes/croet/research/lloyd-mccullough-lab.cfm>

2012 CROET Publications

In 2012, CROET scientists published more than 30 peer-reviewed articles in scientific journals. Scientific publishing is an essential part of a scientist’s life, because it provides detailed descriptions of the research questions being addressed, materials and methods used in experiments to answer those questions, the experimental results, and a discussion of those results in the context of what has been shown previously. The following are a selected list of CROET publications from 2012:

Effects of neonatal methamphetamine and thioperamide exposure on spatial memory retention and circadian activity later in life. Eastwood E, Allen CN, Raber J. Behav Brain Res. 2012 Apr 21;230(1):229-36.

Experimental strategy for translational studies of organophosphorus pesticide neurotoxicity based on real-world occupational exposures to chlorpyrifos.

Lein PJ, Bonner MR, Farahat FM, Olson JR, Rohlman DS, Fenske RA, Lattal KM, Lasarev MR, Galvin K, Farahat TM, Anger WK. Neurotoxicology. 2012 Aug;33(4):660-8.

Loss of circadian clock accelerates aging in neurodegeneration-prone mutants.

Krishnan N, Rakshit K, Chow ES, Wentzell JS, Kretzschmar D, Giebultowicz JM. Neurobiol Dis. 2012 Mar;45(3):1129-35.

A comprehensive strategy to discover inhibitors of the translesion synthesis DNA polymerase κ .

Yamanaka K, Dorjsuren D, Eoff RL, Egli M, Maloney DJ, Jadhav A, Simeonov A, Lloyd RS. PLoS One. 2012;7(10):e45032.

Formaldehyde-induced genome instability is suppressed by an XPF-dependent pathway.

Kumari A, Lim YX, Newell AH, Olson SB, McCullough AK. DNA Repair (Amst). 2012 Mar 1;11(3):236-46.

Characterizing hazards and injuries among home care workers. Wipfli, B., Olson, R., Wright, R. R., Garrigues, L., Lees, J. . Home Healthcare Nurse, 30 (7), 387-393 (June/July 2012).

Ergonomics: Practical guidance for assessing truck drivers. Olson, R., Wipfli, B., & Garcia, L. R. Professional Safety, 38-43 (April, 2012).

Using epidemiology and neurotoxicology to reduce risks to young workers.

Rohlman DS, Nuwayhid I, Ismail A, Saddik B. Neurotoxicology. 2012 Aug;33(4):817-22. doi: 10.1016/j.neuro.2012.02.012. Epub 2012 Feb 25.

Neurobehavioral and neurodevelopmental effects of pesticide exposures.

London L, Beseler C, Bouchard MF, Bellinger DC, Colosio C, Grandjean P, Harari R, Kootbodien T, Kromhout H, Little F, Meijster T, Moretto A, Rohlman DS, Stallones L. Neurotoxicology. 2012 Aug;33(4):887-96.

Let’s Get Healthy! Health awareness through public participation in an education and research exhibit.

Marriott LK, Cameron WE, Purnell JQ, Cetola S, Ito MK, Williams CD, Newcomb KC, Randall JA, Messenger WB, Lipus AC, Shannon J. Prog Community Health Partnersh. 2012 Fall;6(3):331-7.

Repeated melatonin supplementation improves sleep in hypertensive patients treated with beta-blockers: a randomized controlled trial.

Scheer FA, Morris CJ, Garcia JI, Smales C, Kelly EE, Marks J, Malhotra A, Shea SA. Sleep. 2012 Oct 1;35(10):1395-402.

Banning Bisphenol A in the United States and Canada: epigenetic science, the precautionary principle, and a missed opportunity to protect the fetus. Mitchell S. Turker. Journal of Health & Biomedical Law. 8.2 (Fall 2012) p173.

Fall Symposium: Aggression at Work

CROET and Portland State University's Occupational Health Psychology Program presented a Fall symposium titled "Workplace Aggression: Causes, Consequences and Prevention" on November 2, 2012. Attendees were provided a comprehensive and often eye-opening look at the impact of aggression in the workplace.



Sandy Hershcovis, Ph.D.

Sandy Hershcovis, Ph.D., Associate Professor and Department Head of Business Administration at the University of Manitoba, provided the keynote address. Dr. Hershcovis defined workplace aggression, identified key predictors and examined the consequences on home and work life. One of her key points was that targets often become perpetrators of violence. Of particular interest to those in the workplace safety and health field is evidence showing that seemingly minor forms of workplace aggression have a large effect, which can spillover into family life. Dr. Hershcovis also examined how witnesses react to and intervene in workplace incivility.

Marilyn Schuster, Deputy Administrator and Policy Manager for Oregon OSHA, addressed Oregon OSHA's involvement in workplace violence issues. In general, Oregon OSHA relies on the General Duty Clause in its expectation that employers will adopt and furnish safety guards and methods necessary to provide a safe place of employment.



Marilyn Schuster

Two other speakers shared a series of recent and ongoing research studies on workplace aggression. Liu-Qin Yang, Ph.D., Assistant Professor at Portland State University Department of Psychology, spoke about her research on supervisor aggression prevention practices and organizational climate. Ginger Hanson, Ph.D., Senior Research Associate at the Center for Health Research at Kaiser Permanente Northwest, presented her research on the consequences of workplace aggression on employee and organizational outcomes.

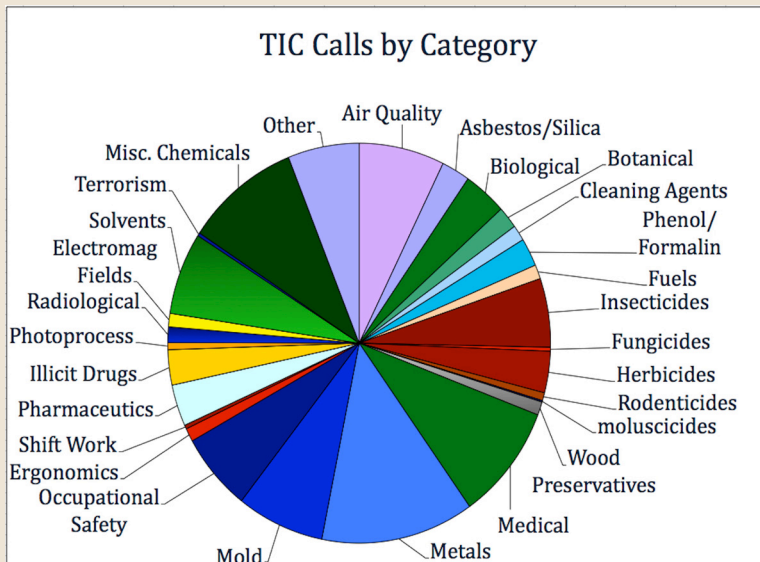
Two of the presentations from this symposium are available as recorded webinars, and we encourage you to check them out at <http://www.ohsu.edu/xd/research/centers-institutes/croet/outreach/health.cfm>.



Liu-Qin Yang, Ph.D.

CROET's Toxicology Information Center

Concerned about the hazards of chemical exposures in your workplace, home or other environments? Having difficulty interpreting an MSDS? What about that mold growing in the bathroom? CROET's Toxicology Information Center (TIC) is here to answer these questions and much more. Our goal is to provide up-to-date, unbiased information in a form that is understandable and useful to you. If you find yourself in need of information about potential hazards in your workplace and home, please call the TIC at 1-800-457-8627 or 503-494-7366. You can also contact us by email at croetweb@ohsu.edu.



Data represents > 1700 calls over 10 years.

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CROET, the Center for Research on Occupational and Environmental Toxicology at Oregon Health & Science University, conducts basic and applied research, provides consultations and offers information on workplace health and safety. CROET's scientists and research staff explore a range of questions relating to health and the prevention of injury and disease in the workforce of Oregon and beyond. CROET's Toxicology Information Center is open to the public and is staffed to answer Oregonians' questions about hazardous substances in the workplace and elsewhere. CROETweb.com provides information about health and safety relevant to industries found in Oregon through links on a series of pages devoted to industry-specific topics.

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