On March 14, 2012, undergraduates from across the nation met at the National Society of Toxicology (SOT) 51st Annual Meeting to discuss the state of undergraduate education in toxicology and their involvement in the SOT. Representatives from the Environmental Toxicology Club from the University of California, Davis, the Toxicology Student Association from the University of California, Berkeley, Tau Omega Chi from St. John’s University, as well as students from Northern Kentucky University, Medgar Evers College, Massachusetts College of Pharmacy and Health Sciences, and Southern University and A & M College attended this meeting to share how programs and student groups at their respective universities teach the science of toxicology. The meeting was also attended by Sue Ford from SOT’s Undergraduate Education Subcommittee and Betty Eidemiller, SOT Director of Education, who have both been long-time supporters of undergraduate involvement in SOT-related activities. This newsletter, re:ADME: Toxiology Undergraduate Newsletter, is the result of our conversation.

Our newsletter aims to connect undergraduates in toxicology from across the nation with each other and inform students as well as recent alumni of current events, activities in toxicology, and new topics of research. Currently our community of undergraduates in toxicology is small, however, we continue to grow and to create a network that is beneficial to all members through the sharing of knowledge and opportunities. We hope that through this newsletter we achieve the aforementioned and gain a more active role in the National SOT as undergraduates in an expanding field.

How can you be involved and help our effort?
1. Join us! If you are an undergraduate or recent alumni and you would like to contribute to re:ADME, I encourage you to join as a writer, editor, or both. This newsletter is a place for your voice to be heard. You can join by simply emailing me at nairihartooni@gmail.com or joining our Google Group.

2. Advertise opportunities! Those of you who know of employment or research opportunities available to students or recent alumni from across the nation and would like to advertise in re:ADME, you can also contact me.

3. Spread the word! Please share this newsletter with your peers within and outside of the field of toxicology. Let us join together in spreading knowledge about our respected science through the written word.

Thank you for reading our newsletter. We hope you enjoy the content and learn something new.

Best,
Nairi Hartooni
Alumni
University of California, Berkeley 2011
The Environmental Health and Toxicology Club at the University of Southern Maine was founded at the end of the 2008-2009 academic year. Students have actively attended the Annual Society of Toxicology meetings in 2009, 2010, 2011, and 2012. This past academic year, the club had two student trips, three local projects and an ongoing Gulf Voyage.

In the fall, our students participated in a series of short voyages in the Gulf of Maine conducting a marine toxicology study of humpback, fin and Northern right whales. We are finding these whales to have high skin levels of genotoxic metals.

Early in February, our students successfully launched and retrieved a scientific balloon with payloads carrying experiments. The aim of this project was to launch a balloon to an altitude of 100,000 ft. in order to determine the effects of altitude on chromium induced chromosome damage and cell survival. This is a novel approach to produce data that may provide some unique insight to possible risks for frequent flyers and flight crews. The balloon was successfully launched and retrieved, and the experiments are currently being analyzed.

A few weeks later, during our February break, our student members gave up their break to help the Vieques Historical Conservation and Trust. Our goal was to clean up and repaint an old school building in Vieques, Puerto Rico that had been abandoned for 12 years. The building was overgrown with jungle brush and overrun by lizards, bugs, and horses. Our parent lab, the Wise Laboratory of Environmental and Genetic Toxicology, and the Vieques Conservation Trust have a mutual vision of turning this building into a marine toxicology laboratory and an educational outreach center for kids and adults alike. The students and our PI, Dr. John Wise, spent 4 full days under the Caribbean sun clearing the buildings of brush and trash in order to prep the buildings for painting and renovations. Students also presented at a variety of local schools about whales, toxicology, and the development of the local laboratory. Many of the students expressed interest and excitement about the new developments, and the Trust was quite pleased with the progress at the school.

Our plan for this new research facility will be to conduct toxicology research on whales surrounding Vieques and Puerto Rico, sea turtles that nest there, corals from off the coast, and bioluminescent plankton from the bioluminescent bay. Vieques is home to one of the brightest bioluminescent bays in the world (if not the brightest), and there is a lot of interest in protecting its health and preserving its future. This island also has an interesting history; for 40+ years, the US Navy used the ends of the islands and surrounding waters for bomb testing. The bomb testing stopped about a decade ago, but there are still large areas of the island that are closed off from public access due to “unexploded ordinances.” These ordinances pose a risk of heavy metal leaching to the local environment; therefore our goal is to collect tissue samples from whales, bioluminescent plankton, and other biota to determine the consequences of metal exposure.

March, our students attend the 51st annual meeting of the Society of Toxicology to present various research topics they have been working on in the previous year. These topics ranged from toxicity of chemical dispersants to whale cells, chromium toxicity in human cells, and the effects of altered gravity on DNA damage and repair. This was the third
attendance for the club at SOT and eight students presented posters. In April, the students of the club collaborated with students in the New England Chapter of the Society of Marine Mammalogy to mark the anniversary of the Gulf Oil spill and show the IMAX film, “Whales: An Unforgettable Journey,” narrated by Patrick Stewart. Next, in May, before the end of the spring semester we helped the local organization, Friends of Casco Bay, with a beach cleanup in Portland, Maine.

Currently, the club is back out at sea again participating in its third year of marine toxicology research in the Gulf of Mexico. Students spend time in the summer at sea in the Gulf collecting whale biopsies and a variety of environmental samples ranging from water and air to fish and squid. The samples are then analyzed for pollutant levels, DNA effects, and then cell culture studies in the laboratory.

It’s been a busy year for us in Maine!

**UC Davis Environmental Toxicology Club**
by Christopher E. Mangasarian

The Environmental Toxicology Club (ETOX Club) is a social and educational organization sponsored by the Department of Environmental Toxicology at the University of California, Davis. The club welcomes all UC Davis students interested in the field of toxicology and related disciplines. In addition to meetings and community service activities, the club sponsors events aimed to further our members’ knowledge of current topics in toxicology. The main goal of our organization is to help bridge the gap between faculty, alumni, professionals in the field of toxicology, and our members. The club also provides a forum for students to learn about employment/internship opportunities, and participate in career development workshops.

This past year the club has focused on informing our members about opportunities for students in toxicology related professional societies such as the Society of Toxicology (SOT), and Society of Environmental Toxicology and Chemistry (SETAC). Using funds from the Northern California SOT Travel Award Grant, which was awarded to an officer in the ETOX Cub, many of our members were given the opportunity through a carpool organized by the club to attend the SOT’s 51st Annual Meeting in San Francisco this year. Information regarding meetings of both SOT and SETAC local chapters was frequently passed out during club-organized events, and guest speakers from both organizations gave presentations at our quarterly club meetings.

Along with outreach to professional societies, this past year the club has organized some of the more traditional events we are known for, including the very popular Annual Student-Faculty Bowl-Off. Events like the Bowl-Off, Game Night, and Movie Night are a great success, and allow students to get to meet the Environmental Toxicology Department faculty in a more open and casual setting. Many of our members have praised events like these for creating a welcoming situation for students and faculty to converse. This year we started a new tradition called the Annual Day Hike, which we hope to continue in the following years. The hike was lead by our Department Chair, Prof. Ronald Tjeerdema, in nearby Stebbins Cold Canyon Reserve. Prof. Tjeerdema led a group of members on a hike through the beautiful canyon and up a ridge with sweeping views of Lake Berryessa below all while discussing the local ecosystem in and around the lake, and the threat of pollution to its sustainability.

The club has also continued to organize once monthly Brown Bag Lunches with faculty. Every month a lunch is held in any number of beautiful garden locations on the UCD campus. Students meet a faculty member from the ETOX Department with a bag lunch to enjoy their lunch and have a Q & A session. This year the club has expanded this event by inviting Graduate Students in the field of toxicology to attend as mentors. We were very pleased to have a couple UCD Graduate Students attend the lunches and discuss with our undergraduate members their transition into a graduate program. Our members were very eager to learn as much as they could about life in graduate school, as most of them would be applying to different graduate programs in the upcoming years. We also had a professor on the UCD Graduate School Admissions Committee come to the event...
and discuss the admission process, which our members found very helpful.

Under the guidance of the ETOX Club our members have been heavily involved with an on-campus E-Waste Recycling Program. Throughout the academic year, members volunteered to pick-up and drive electronic waste to a nearby recycling center. The club worked with the E-Waste Recycling Program to hold an informational seminar on the environmental hazards of improper electronic waste disposal. Over 100 UCD students attended the seminar, and the ETOX Club has decided to continue working with the E-Waste Recycling Program next year to inform more of the public about electronic waste and recycling.

In conjunction with the ETOX Department the club has sent out monthly newsletters with information regarding volunteer, internship, and employment opportunities to students in the ETOX program. Next academic year we plan to hold resume building and interview workshops with the help of the UCD Career Center, as well as continue to send out employment/internship opportunity information in the newsletter.

The ETOX Club at UC Davis has been steadily growing along with the Environmental Toxicology Department these last couple of years. We will continue to expand alongside the department and provide students with opportunities to meet faculty, alumni, and professionals in the field of toxicology. The success of the club is only as strong as the students that participate in it, and there is no doubt that our students present and future will continue to work hard for the continuation of ETOX Club and their peers who benefit from the organization.

St. John’s Tau Omega Chi Toxicology Club

by Kristen Brocavich

At St John’s University, undergraduate toxicology students have a plethora of opportunities to become more involved with the field of toxicology. Students are able to assist faculty members by conducting research, attend the Society of Toxicology (SOT) or Mid-Atlantic Society of Toxicology (MASOT) meetings, or take an active role in Tau Omega Chi, the Toxicology club. One event that the whole toxicology department, undergraduates, graduate students, and the faculty, look forward to each year is ToxExpo. Sponsored by the College of Pharmacy and Health Professions, the Toxicology Program, and Tau Omega Chi, ToxExpo is the last big event of the spring semester and a time to recognize the work of the undergraduates, especially the graduating seniors.

ToxExpo 2012 was held on April 23rd and included a full schedule of toxicology related events. The day began with an active poster session, where undergraduate students presented their research on a toxin or a toxicology related event to the faculty and other students. The posters being presented were juniors’ and seniors’ projects from three different classes offered as part of the undergraduate toxicology curriculum. The Principles of Toxicology course is a two semester long course where third year students get to learn about specific toxins as well as toxicokinetics and the effects of the toxin on different organ systems. Third year students’ posters focused on a particular toxin or toxicant that was researched such as botulinum toxin, air pollution, carbon monoxide poisonings, and tetrodotoxin. During this poster session, the graduating seniors also presented projects done in two of their courses- Toxicology Colloquium and Regulatory Toxicology and Risk Assessment. Toxicology Colloquium is a course that offers students the opportunity to work on their public speaking skills by presenting every two weeks on a toxicology related topic. Some posters featured from this course included organotins and toxicity of breast implants. The Regulatory Toxicology and Risk Assessment course focuses on safety assessment and evaluation of potential toxic hazards.

After the poster session, the undergraduate students were given the opportunity to engage in a Career Chat with Dr. Kendall Wallace. Dr. Wallace is an accomplished toxicologist, particularly in the field of academia. He is the founding director of the University Of Minnesota Chemical Toxicology Research Center and the University Toxicology Graduate Program. Dr. Wallace has been given the title of "Basic Science Teacher of the Year" by the University of
Minnesota-Duluth Medical School on four different occasions for his accomplishments in teaching. In addition to many publications on mitochondrial research and his contributions to academia, Dr. Wallace has also served as the past president of the Society Of Toxicology, SOT. Through extensive experience in the field of toxicology, Dr. Wallace was able to answer many of the questions posed by students.

In the afternoon, attendees listened to Dr. Kendall Wallace, the keynote speaker, discuss his research on molecular remodeling with Doxorubicin-Induced Cardiomyopathy. The research that he discussed dealt with comparing the adverse and the adaptive responses. Some of Dr. Wallace's research interests include studying mitochondrial toxicities and metabolic disorders associated with pharmaceutical exposure, as well as mitochondrial epigenetics.

Dr. Wallace's keynote speech was followed by the last ToxExpo presentation - the senior project for the Regulatory Toxicology and Risk Assessment course, taught by Dr. Sue Ford. Each year, the senior class is given a hypothetical scenario involving a new compound that has been found to have adverse health or environmental effects on the community. Over the course of the semester, the seniors research the compound, evaluate the hazards of the compound and determine a mode of action to prevent any further toxic effects on the community exposed. At ToxExpo, the seniors present their findings in the form of a press conference to notify the stakeholders of the compound outbreak, to notify them on any precautions they should be taking and to discuss the potential hazards of the compound. This year, the topic of the Risk Assessment press conference was "The Adulteration of Personal Care Products with Nickel (II) Chloride Hexahydrate". The scenario presented involved a woman who found bins of Nickel (II) Chloride Hexahydrate in the back of her rented storefront where she sold her personal care products. Not knowing the contents of the bins, the woman began to incorporate the Nickel (II) Chloride into her soap, shampoo and bath salts to give them an attractive emerald color. Soon after, customers began to have skin irritations which led to the need of a press conference. During the press conference, the seniors answered questions from "members of the community" who were concerned with the potential environmental toxicity, adverse effects on children and means of disposal.

The events of ToxExpo concluded with two rounds of Tox Throwdown, a toxicology trivia game. Each round consisted of two teams of students answering a series of toxicology questions ranging from asking about toxins to pop culture questions such as "What was the metal contaminating the water in the movie "Erin Brockovitch". Tox Throwdown is a fun way to conclude ToxExpo each year, and is highly anticipated by all the students. Ultimately, ToxExpo is a way in which the toxicology program can give back to the university by sharing our knowledge with those who are unfamiliar with issues in toxicology.

UC Berkeley Toxicology Student Association
by Chenchen Han, Jon Chee, and Hiroko Irimagawa

The Toxicology Student Association of Berkeley (ToxSA) was founded in 2010 by a group of students who were inspired by Dr. Chris Vulpe's undergraduate course on Molecular Toxicology at the University of California, Berkeley. What started as a small group of friends with a passion for toxicology, blossomed into a thriving community comprised of supportive and intellectually curious student leaders. With a genuine passion for the field of toxicology and a sincere desire to serve the community, the ToxSA team has been dedicated to helping its members develop academically, professionally, and personally for the past two years. As a student-run organization, ToxSA believes it is imperative not only to engage with members at meetings but also to support them with resources to succeed in their fields of study. To this end, the peer-advising, career-prep, and community service divisions of ToxSA have made great strides in providing students with skill-set seminars and outreach events each semester.

Career Preparation:
Throughout the semester, ToxSA helped students prepare for their transition into the professional world of toxicology by hosting workshops that aim to hone the skills necessary for
success in the field. Prior to the campus-wide career fair held at UC Berkeley, ToxSA held a resume workshop for its members where executives critiqued individual resumes and helped members highlight their talents and achievements. In addition to resume building, ToxSA provided students with resources on career opportunities and strategies on how to effectively perform during interviews. By hosting one-on-one and group mock interviews, members were able to gain insight on the interview process and obtain practical experience. Ranging from how to properly shake hands to question and answer techniques, our mock interviews provided students with the skills needed to ace an interview and land a job. In regards to career opportunities, ToxSA has continued to build a network of professional connections with research facilities on and off campus as well as industry toxicologists in the Bay Area and beyond.

The NorCal Society of Toxicology (NorCal SOT) is a major supporter of ToxSA. They have helped fund Dr. Luoping Zhang’s class at UC Berkeley and most ToxSA members attend the NorCal SOT’s biannual meetings. In November 2011, ToxSA held its first Career Panel with sponsorship from NorCal SOT. Professor Luoping Zhang and Brandon Gayton, graduate student representative for NorCal SOT, worked together with the executive team of ToxSA to organize an immensely successful speaker panel.

In order to achieve our goal of informing students of the various paths taken by toxicologists as well as providing networking opportunities, we invited panelists from a variety of fields related to toxicology. These included Donna M. Dambach from Genentech to address the pharmaceutical aspect of toxicology, Andrew Olaharski from Elan, George Clemens from Rigel, Thomas Kearney, a clinical toxicologist from UCSF, Melanie Marty from the California Environmental Protection Agency and Robert Rice from the University of California, Davis as an academic expert in toxicology. The executive team of ToxSA was proud to present these eminent toxicologists to students from universities and community colleges in the Bay Area. All participants were invited to a sit-down dinner with the panelists as well as other guest experts. ToxSA executive members took the initiative by leading conversations at each table to help the attendees build connections and gain personal insight into a professional’s respective career. After dinner, professional guests answered questions as a panel and in an open Question and Answer Session. During dessert, the panel further interacted with students and attendees were able to get better acquainted and to network with each other.

**Peer Advising:**
As an organization, ToxSA has worked tirelessly to offer students the support they need to succeed in their academic endeavors and grow holistically as individuals. As college students, it can be incredibly difficult to balance school-work with one’s professional pursuits, and in an attempt to remedy this issue, ToxSA has provided peer advising to the UC Berkeley student body in numerous ways. In terms of services, ToxSA has made great strides in aiding the UC Berkeley toxicology community through hosting various events ranging from workshops on class scheduling to Brown Bag networking lunches.

Cultivating student-professor relationships is one of the ways in which ToxSA gives back to the greater student body. With vast class sizes, it has become increasingly difficult to develop strong personal connections with one’s professors. Due to this, ToxSA organized Brown Bag lunches with toxicology professors on campus and industry professionals where students are able to network with toxicologists and ask questions. Dr. Dale Leitman and Dr. Martyn Smith, who are both toxicology professors at UC Berkeley, were among our guests at these events and discussed topics ranging from their personal laboratory research projects to strategies that young toxicologists need to know in order to succeed in the field. In addition to receiving academic and professional advice from professors, ToxSA co-hosted a barbeque and nature hike with Dr. Vulpe in order to develop stronger connections within the toxicology student body.

In regards to guest speakers from industry, Dr. Ryan Williams, a toxicologist at the popular green-products company Method,
shared his knowledge about how to succeed in a revolutionary new industry. As with our other speakers, he was incredibly passionate about his work and advised students that maintaining one’s enthusiasm for the field and remaining persistent is the key to one’s success as a toxicologist. Speaker Dr. Sandra Sachs from the Oakland Police department provided an intriguing look into the world of forensic toxicology and provided insight into how toxicology goes hand in hand with the law. She also went on to advise ToxSA members on ways to obtain employment in the public sector as a toxicologist. ToxSA’s diverse group of speakers has made for a semester that demonstrated the limitless possibilities of working or studying in the vast field of toxicology.

Community Service:
ToxSA is particularly proud of its commitment to community service by way of the Lead Education and Awareness Program (LEAP). LEAP teaches children about lead poisoning and other possible toxic household hazards by applying basic principles of toxicology. It is our strong belief as a student organization that by teaching children about these hazards we may better inform a larger part of the community, especially as we encourage them to talk about what they have learned in our program at home with their families. Toxic hazards, such as lead poisoning, are unfortunately more commonly found in households of lower socio-economic standing, especially in communities in Alameda and Contra Costa counties.

In the Fall of 2011, LEAP volunteers headed to Brookfield Elementary in the city of Oakland in Alameda County. Like most cities, parts of Oakland are comprised of lower-income neighborhoods and higher rates of poverty. As an informed organization, ToxSA saw the benefit of extending our knowledge to areas it could greatly benefit. We held two 90 minute sessions for Mr. Hilliard’s fourth grade class at the school starting with an introduction on what toxins are, where they’re found, and how to respond to medical emergencies involving toxins. In the second session we highlighted which products and daily objects may contain lead, what effect lead can have on their bodies, and how to properly prevent themselves from being poisoned. In the beginning of our first session, a student named Jesus didn’t seem particularly interested in the topic and paid little attention to our presentation. We did our best to engage him and promised that as a Junior Toxicologist gaining more knowledge on the subject he could be responsible for helping not only himself but also his family and friends. When we came back a month later, we noticed a complete change in Jesus’s attitude. He was attentive and even insisted that a few of his distracted classmates focus on our presentation. We were both gratified and excited at the prospect of inspiring a younger generation to study a field we so loved and found so important to general health.

In spring 2012, LEAP headed out to the city of San Pablo in Contra Costa County to reach out to Mrs. Demshok’s third grade class in Tara Hills Elementary. In spite of their much younger age, these students paid attention to every little detail of our lessons. When we returned for a second session, everyone was able to easily recite what we had taught them. Gabrielle, one among 27 eager students in the classroom, shared with us that she went home after the first of two visits and taught her younger siblings how to to wash their hands after playing, how to determine if a substance is poisonous and, in the worst case, what to tell a 911 operator in the case of an emergency. LEAP volunteers always return feeling inspired after experiencing their knowledge positively affecting nearby communities.

It has been a fulfilling year for ToxSA as we hope to continue providing events and networking with the community at this pace. In the coming year we plan to hold a Pharmaceutical Toxicology Seminar due to the overwhelming interest among Berkeley students in this field. We’re also interested in organizing a “Tox Week” on campus to introduce all students to toxicology and the many possibilities in career options available to a toxicology student. Finally, we will continue to provide students with our core services in peer advising, career preparation, and community service. ToxSA is constantly developing events and opportunities that enrich the academic and professional lives of our members via fresh insight from new members that join the executive team.

We are eager to nourish ToxSA’s growth forward as it nears its 3rd anniversary!
I graduated from college with no concrete plans and no immediate job prospects, with only a vague idea of what sort of work I wanted to look for. I have since found out that it’s perfectly fine to have nothing but possibilities awaiting each day. At this point of your life you can selfishly pursue your interests and relish in all of the opportunities to be had! Don’t be afraid to take chances and move out of your comfort zone if it means that you’ll be closer to doing something you’re passionate about. In the interest of full disclosure, I haven’t completely figured out my way just yet, but as an alumus, I wanted to share a few words of advice with those of you still in college.

Starting off my adult life with a college degree and no immediate goals other than to be gainfully employed and to attain experience was often viewed as a lack of ambition. In 2010, I graduated from University of California, Berkeley with a Bachelors of Science in Molecular Toxicology. Since then I have been navigating the international science community trying to figure out what to do next for my career. It’s understandable that I felt I was being perceived as a lost sheep as my peers nearly always had their futures mapped out. They had admirable plans that involved earning a PhD, studying abroad or going to pharmacy school. Me? Well, I just wanted to find a job doing something somewhat related to toxicology.

Fortunately, I was awarded an Oak Ridge Institute for Science and Education (ORISE) fellowship working for the Food and Drug Administration (FDA) in Washington, D.C. The project I was hired to work on involves harvesting data and going through archives of past studies. It’s not always glamorous work, but the opportunities and resources available have been invaluable to my personal development. The fellowship includes a limited amount of funding specifically for my personal development and education. Due to this funding I have been able to attend several scientific conferences where I have been working on building my network of professional scientists. Although the importance of networking has become rather trite, its role in career development can not be overstated. The people you meet networking are often the people that you’ll end up working with if your career plans go well. Take the time to meet with them and listen to their ideas and advice. If you have the opportunity to attend meetings or conferences, be sure to go. These meetings are where you learn about the latest and greatest developments in specific fields and it is a terrific way to test whether or not that research sparks your interest before you make the commitment to a particular career or graduate school.

Without the shelter of the academic realm and the reality of being cast into the adult world, I have stubbornly maintained my aversion to going to graduate school. This personal mandate has nothing to do with a fear of returning to school. It is built upon a stubborn determination to demonstrate that it is possible to make meaningful contributions to the world in the name of science without earning a PhD. I don’t hesitate in the slightest to acknowledge that earning a PhD is a tremendous accomplishment and that the knowledge and experience earned during the process are unparalleled. However, this does not mean that a bachelor’s degree must be maintained as merely a starting point.

The experiences and knowledge earned during the undergraduate years are based entirely off of what students make them. As undergraduates, we shouldn’t feel like we must state that we have "only" a bachelor’s degree. It’s a tremendous achievement that will help impart the skills that are needed to reach life goals. Scientists with bachelor’s degrees can contribute meaningfully to the international scientific community but they may have to work harder to gain attention from their peers. Scientists must look beyond the letters tacked at the end of names and instead examine the thoughts and ideas of the person in front of them. At the end of the day it’s about demonstrating your sheer determination and passion for a subject of which you’re reasonably knowledgeable.

My advice to current students is based on being confident in knowing what interests you and having the courage to seek opportunities to develop your passion. If I could go back and redo undergrad I would spend more time picking the brains of my professors and getting to know the people behind the research. Apprenticeships would allow students to understand the process and to take an active role in the creation of good science. More laboratory research opportunities would allow students to participate in the science community before they earn any degrees. There is no reason to hold oneself back due to any particular student status. Take advantage of all of the opportunities available, and never second guess your abilities. Simply put, never accept no for an answer. For toxicology students especially, don’t lose sight of how toxicology is truly interdisciplinary and how it’s crucial to understand a variety of subjects. Keeping this in mind will help you apply toxicology knowledge into a wide range of contexts. You will likely find that most people are more than willing to help if asked. Take the time to explore different fields of interest to determine your dream career. And above all else, don’t be afraid to take the path less traveled, you never know what you might learn along the way.
An Informative View on Flame Retardants

By Hien Nguyen

Although you might not know it, your couch may contain toxic chemicals that could be hazardous to your health. Jennie Vu, a college student, sent in a sample of her living room couch and found that it tested positive for the presence of halogenated chemicals, a likely sign that her couch met the California Technical Bulletin 117, or TB117 for short. Enacted in 1975, this piece of legislation required that furniture manufacturers produce home furniture that could resist a small, candle sized flame for at least twelve seconds. As a result of this legislation, chemicals were added to the foam filling inside office chairs, couches, seat pads, sofa beds, baby cribs sold in California for the past thirty years. As factories mass produced furniture under California’s new standards, the treated furniture began to sell in other states as well.

Pentabromodiphenyl, penta BDE for short, has been one of the most commonly used chemicals in furniture manufacturing. Multiple studies have found an association between the polybrominated diphenyl ether (poly BDEs) class and health risks such as neurotoxicity, endocrine disruption, and reproductive disruption in animals. In a study, 0.8 mg/kg or 12 mg/kg of penta-BDE and 0.7 mg/kg or 10.5 mg/kg of tetrab-BDE were administered to rats post-natal day 10. Several months after dosing, it was found that treated rats had decreased learning and memory as well as motor behavior (Eriksson et al., 1998). Mice and rats exposed orally to pentaBDE at 18 mg/kg, were found to have depressed T4 (thyroid hormone) levels. Mice after a single oral dose of 0.8 mg/kg had decreased T4 levels for 8 days (Fowle et al., 1994). Reduced sperm and spermatid count was found in rats exposed to PBDE levels of 60 micrograms to 300 micrograms/kg body weight (Kuriyama et al., 2005).

In addition, studies have found that penta BDE is bioaccumulative, found in the body fat of humans and domestic animals. A comparative study in 2010 found that American schoolchildren in California had seven times the levels of penta BDE in their blood serum compared to schoolchildren from Mexico (Eskenazi et al., 2011). Since flame retardants are not physically or chemically bound to the foam when manufactured, they migrate out of furniture into the dust, thus being exposed to humans, particularly babies as well as household pets.

Arlene Blum, director of the Green Science Policy Institute and a biophysical chemist, is the leading scientist in heading the campaign to change public policy on flame retardants. She has been monumental in this fight. Blum first became aware of this issue when she measured and found high levels of flame retardants in her furniture and her cat. She proceeded to throw out her couch and to live without furniture containing flame retardants. “It is very sad that the flame retardants come out of the furniture into dust and end up in our bodies and wild animals. We do not need the chemicals in our furniture and we certainly do not need them in our bodies, our pets, or our wildlife.”

Fortunately, U.S. furniture manufacturers phased out penta BDE in 2008. In addition, several states such as California, Oregon, New York have enacted laws banning the manufacturing or distribution of some PBDEs. Unfortunately, that still means furniture manufactured from the 1970s till 2008 contains this chemical in addition to similar replacement compounds. TDCPP, a replacement flame retardant, was banned from children’s sleepwear in the 1970s. It has since been used as a flame retardant in our furniture. Only in 2011 did California’s Carcinogen Identification Committee vote to list TDCPP as a carcinogen.

Governor Jerry Brown has proposed that California’s lawmakers act to readjust the state’s flammability standards by next year. However, this still means that the bill needs to be written and passed by California’s legislature. The current TB 117 requires furniture to be resistant to an open flame but does not specify how. Since a flame’s first barrier to entry is the upholstery, it would make more sense for the fabric of the furniture to be flame resistant rather than the foam. In addition, the new legislation could require that no chemical additives be added to ensure that furniture manufacturers instead develop and improve upon naturally flame resistant fabrics such as polyester. Blum states, “ Flame retardants should only be used when there is a proven fire safety benefit. In that case, the chemicals need to be tested for toxicity before they are used, and only safe chemicals should be put in consumer products with high levels of human exposure.”

Last summer, I was fortunate enough to intern with the Green Science Policy Institute under Arlene Blum, the woman who had first worked on the research behind flame retardants in children’s sleepwear in 1977.

As a witness to this campaign, I saw how one female scientist can literally change policy. It serves as a reminder for how important scientific inquiries and discoveries can truly change the world for the better. Her word of advice to aspiring toxicologists: “Decide what interests you, study hard, and then think about how you can use your research to change policy or work with industry to produce safer products and protect our health and environment.”

References


On March 10, 2012 during the week of the National Society of Toxicology Annual Meeting, the Toxicology Student Association (ToxSA) of University of California, Berkeley in conjunction with the Northern California Society of Toxicology (NorCal SOT) organized a K-12 event at the Lawrence Hall of Science. The event was called, “What do Snow White, Romeo and Juliet, and The Madhatter have in Common?....Toxicology.” The day consisted of hands-on experiments that were designed to introduce the public to toxicology and how this specific science can be used to protect people, the environment, and the world.

This event was not the first time ToxSA worked with NorCal SOT. In the fall of 2011 the two organizations put together a toxicology career panel for students in the Bay Area at UC Berkeley. The event was a great success and due to this relationship between the two organizations, the NorCal SOT asked ToxSA to aid in the planning of the event at the Lawrence Hall of Science.

Volunteers from undergraduates to senior toxicologists who are members of the SOT, NorCal SOT, Environmental Toxicology Club from UC Davis, and/or ToxSA operated the entire event. The volunteers were trained in what experiment they would teach and a select few were asked to memorize the lines for the skit.

Three different experiments were performed that highlighted the importance of dose, risk, exposure and other areas of toxicology. The first room contained experiments about household hazards. In this room visitors identified hazardous materials and also tried to distinguished between toxic and non-toxic products that look alike. The second room contained experiments based on environmental toxicity. First the visitors viewed a demonstration and talked about acids and bases, then an experiment was performed to see what happens when chalk reacts with vinegar (a strong acid), and finally different acids and bases were added into a bowl to demonstrate what happens when products are dumped into the water system and how that can change the pH of the water. The final room was based on the effects of dose response. Here a demonstration was shown on the meaning of concentration and the effect of size on concentration, then California blackworms were immersed in different concentrations of alcohol and then caffeine and observations were made.

These experiments were then followed by a skit, which reiterated what the visitors had learned during the experiments. During the experiments, visitors were given a handbook that included a couple of questions regarding each of the experiments. When the visitors had finished answering questions in their handbook they had them checked by a table of senior toxicologists who then gave the visitor a certificate of completion as a Junior Toxicologist.

This event was a great success thanks to the many people who helped plan and execute it. The collaboration between ToxSA, NorCal SOT, and SOT to orchestrate this event was beneficial for all the involved parties and the event was a great opportunity for students to network with professional volunteers. Hopefully in the future there will be more collaboration between undergraduate organizations and regional and/or national SOT to plan events where the public can be informed about the importance of toxicology in our world.
Did you know that the medication you take everyday could be heavily influenced by the food you eat? Many Americans have begun to alter their diets in order to aid in the effectiveness of their medication. However, a large group of the population remains unaware of the drug interaction from their diet and could be at risk for harmful or unknown side effects.

Recent scientific advances and documented clinical cases have broadened our understanding in these interactions. Warfarin, an oral anticoagulant agent, is a representative example of an extensively studied food and drug interaction. Warfarin has a very narrow therapeutic index, which means the effective dose range between drug efficacy and toxic overdose is very small.[1]

If the blood concentration of warfarin is not monitored carefully, there may be alterations in the pharmacodynamic and pharmacokinetic properties of the drug, which could lead to adverse complications. Foods like grapefruit juice and cranberry juice have been reported to increase blood concentrations of warfarin via Cytochrome P450s inhibition. On the other hand, St. John’s Wort (Hypericum perforatum), an herbal treatment for depression, has been shown to reduce the therapeutic efficacy of warfarin by CYP 2C9 and 1A2 induction.[2]

Soy is another product that can potentially influence the same hormones involved in contraception. Soybeans contain trace amounts of estrogen-like compounds known as isoflavones.[4] The excessive consumption of soymilk may cause hormone-related side effects, such as abnormal uterine bleeding, which are also seen among women taking birth control pills. Scientists have not specifically investigated the rate of side effects or unplanned pregnancy among women using contraceptives in conjunction with soymilk.

This is not a warning to discourage the use of food and herbal medications, but rather to educate consumers about potential drug interactions. Although the aforementioned interactions have not been proven conclusively, this suggests that patients should be more aware and talk more openly to their health care providers about their diet before taking medications.

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