

# CIT Update

Michigan State University

Summer 2007

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## Center for Integrative Toxicology

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## Dioxin and Dioxin-Like Compounds

# Superfund Workshop Planned

The CIT's Superfund Program Research Translation Core is hosting a one-day workshop on September 19, 2007 to review and exchange ideas concerning the findings of the recently released studies by the National Academy



**David Eaton, Ph.D., University of Washington, will present "NAS/NRC Report: Health Risks from Dioxin and Related Compounds."**

Three internationally-known speakers will give plenary presentations. Dr. Dave Eaton, chairperson of the NAS Committee, and Dr. Martin Vanden Berg, chairperson of the WHO committee, will each provide overviews of the findings from their respective committees. In addition, Dr. Chiharu Tohyama, University of Tokyo, will provide a perspective regarding health and environmental policy implications of the current state-of-the-science related to dioxin and related compounds

in Japan.

Following the plenary presentations, breakout and feedback sessions will foster open discussion and future collaborations between attending scientists and stakeholders from academia, industry, and government.

As part of the Superfund Basic Research Program grant to the CIT from the National Institute of Environmental Health Science, this workshop is



**Chiharu Tohyama, Ph.D., University of Tokyo, will present "Dioxins: Science, Public Perception and Risk Assessment/Management in Japan."**



**Martin Van den Berg, Ph.D., Utrecht University, will present "The 2005 Re-evaluation of Toxic Equivalency Factors for Dioxin-like Compounds and Some Views from a European Perspective."**

being provided free-of-charge to all participants, but seating capacity is limited.

Ensure a place by calling 517-353-6469 or e-mailing [tox@msu.edu](mailto:tox@msu.edu) as soon as possible.

Overnight accommodations are available at the Kellogg Center by calling 517-432-4000 or Candlewood Suites at 517-351-8181.



# Message from the Director

As the Spring of the 2006-2007 Academic year draws to a close, many highlights come to mind.

MSU faculty and trainees affiliated with the CIT once again had a strong presence at the Society of Toxicology Annual Meeting. This year, over 50 papers were presented from MSU faculty and students. In addition, eight trainees received travel awards and/or specialty section awards. The CIT hosted another MSU Alumni and Friends dessert reception that was well attended.

The CIT also launched the first annual Distinguished Scholars in Toxicology Lecture Series. The series was hosted in cooperation with the Department of Pharmacology and Toxicology and was funded in part by the MSU Graduate School. Jose Manautou, from the University of Connecticut, and David Sherr, from Boston University, were the featured presenters.

In the CIT's Environmental and Integrative Toxicological Sciences training program, review committees for both the toxicology track and the

environmental track completed a comprehensive internal curriculum review. A number of important changes were implemented in the content of existing courses, as well as the addition of new courses. These changes help insure that our trainees are knowledgeable with and have experience in leading edge areas such as "omics" technologies. The changes have been formally accepted and implemented by the University.

A faculty search is currently underway to recruit a tenure-stream faculty member at the level of Assistant or Associate Professor. The search committee, chaired by Dr. Jay Goodman and committee members Drs. John LaPres, James Pestka and Susan Conrad, has received a strong response to the faculty position posting and has identified a number of outstanding candidates who will be visiting the MSU campus for interviews this spring and summer. The successful candidate will be jointly appointed in the CIT and an affiliated department and will contribute in the area of chemical carcinogenesis or developmental toxicology.

The CIT Superfund Program is planning a one-day workshop on campus in September to review and exchange ideas concerning dioxin and dioxin-like compounds. (See page 1.)

As we prepare for the coming academic year, I am confident that MSU will continue to distinguish itself in the area of toxicology. I look forward to your partnership in this important endeavor.



## ***Distinguished Scholars in Toxicology Lecture Series***

David Sherr, Ph.D. of Boston University, presented the second lecture in the CIT's Distinguished Scholars in Toxicology Series. He spoke on "The Role of AhR, an Environmental Chemical Receptor, in Mammary Tumor Growth and Invasion." He is pictured on the right with CIT Director, Norb Kaminski (left).

# Notables

• **Colleen Cosgrove Hegg**, assistant professor of Pharmacology and Toxicology and CIT-affiliated faculty, was selected as the 2007 recipient of the American Physiological Society Central Nervous System New Investigator Award. The award recognizes outstanding investigators in the early stages of their career. Hegg joined the MSU faculty last fall. The award carries a cash prize of \$1,000 and travel costs to attend the APS annual meeting.



**Colleen C. Hegg, CIT affiliated faculty member, received the 2007 Central Nervous System New Investigator Award from the American Physiological Society at their annual meeting in May. She is shown here with William Martin, Chair of the CNS Section.**

• **Norb Kaminski**, CIT director and professor of Pharmacology and Toxicology, was honored by the MSU College of Veterinary Medicine at a banquet on May 3, 2007. Kaminski was presented with the Pfizer Animal Health Award for Research Excellence. The award recognized the international prominence of his research in immunotoxicology.

• **Barbara L. Kaplan**, research assistant professor working in the lab of Norb Kaminski, received a Junior Faculty Travel Award to attend "Immunology 2007", the annual meeting of the American Association of Immunologists.

• The Environmental Science and Technology Journal recently announced that a paper **John Giesy** and co-workers from his lab published was one of the three most cited papers in 2006, from nearly 1,100 articles published.

The paper "Perfluorooctanesulfonate and Related Fluorochemicals in Human Blood Samples from China" can be found at <http://pubs.acs.org/cgi-bin/abstract.cgi/esthag/2006/40/i03/abs/es052067y.html>. (Leo WY Yeung, M.K. So, Guibin Jiang, S Taniyasu, N Yamashita, Maoyong Song, Yongning Wu, Jingguang Li, JP Giesy, KS Gurunge, Paul KS Lam. Environ. Sci. Technol.; 2006; 40(3)pp715-720.)

In this paper, Giesy and coworkers reported on their investigations to understand the relationship between exposure to perfluorinated compounds and human health. The researchers measured concentrations of PFCs in blood samples collected from nine cities (eight provinces) in China and found that current concentrations do not present a risk to the human population.

Dr. Giesy has retired from his MSU professorship in zoology and was recently appointed Professor and Canada Research Chair at the University of Saskatchewan.

• Recent master's graduate **Sam Baushke** received the "Outstanding Environmental Engineering MS Student Award" for 2006-2007. The award is given for overall performance in the masters program and contribution to the department. Sam worked in the CIT Superfund Program in Project 6 and Core E, under the tutelage of Syed Hashsham. While pursuing his masters degree, he wrote one book chapter, co-authored three manuscripts that are under circulation, and was part of two more. In addition, he has authored or co-authored more than a dozen posters. Hashsham noted that within the research group he played the role of the "go to" person for bioinformatics-related needs, delivered lectures, and served as a volunteer TA in two university-wide courses (one in CSE and one in Biochemistry).

• **Rashad N. Simmons**, Environmental and Integrative Toxicological Sciences trainee, was the 2007 recipient of the College of Natural Science Alumni Tracy Hammer Graduate Student Award. Simmons is an analytical chemistry doctoral student working on the CIT EITS training program with Professor Victoria McGuffin. Simmons' primary research activities consist of using high-performance liquid chromatography as a model for a ground water system to determine the effects of perfluorinated surfactants on the groundwater transport of co-contaminants as a means of identifying if the presence of the surfactant will lead to increased groundwater contamination.

Simmons also received an international fellowship to participate in the East Asia and Pacific Summer Institutes for U.S. Graduate Students. The fellowship was sponsored by the U.S. National Science Foundation and the Japan Society for the Promotion of Science. His fellowship research, regarding LC-MS/MS determination of fluorinated surfactants in ground water, was performed at the National Institute of Advanced Industrial Science and Technology (AIST) in Tsukuba, Japan.



**Rashad N. Simmons, Analytical Chemistry and, Environmental and Integrative Toxicological Sciences doctoral student, received the 2007 Tracy Hammer Graduate Student Award. Simmons also was honored with an international fellowship.**

# MSU at the 46th Annual SOT Meeting

Many MSU scientists took part in the 2007 Society of Toxicology Meeting this Spring. Over 50 abstracts were presented. The abstracts are listed below under each faculty member's lab.

In addition, many trainees in the CIT's Environmental and Integrative Toxicological Sciences program received travel awards and other honors.

- **Pat Shaw**, a Pharmacology and Toxicology trainee working in Bob Roth's lab, received a best poster award from the Drug Discovery Toxicology Specialty Section.
- **Josh Kwekel**, a Biochemistry and Molecular Biology student working in Tim Zacharewski's lab, received an award for Second Place in the Comparative and Veterinary Toxicology Specialty Section for his abstract "Cross-Species Comparison of Tamoxifen & Estrogen Induced Uterotro-



**Research Associate Professor Zahidul Islam (left) received the Best Publication of the Year Award from the SOT Occupation and Public Health Specialty Section for: Satratoxin G from the Black Mold *Stachybotrys chartarum* Evokes Olfactory Sensory Neuron Loss and Inflammation in the Murine Nose and Brain. *Environ. Health Perspect.*; 114:1099-1107, 2006.**

phy in Rodents." Kwekel also received a travel award from the Reproductive and Developmental Specialty Section.

- **Anna Kopec**, a first year student working in the lab of Tim Zacharewski, presented a poster that received an Honorable Mention Award in the Molecular Biology Specialty Section.
- **Jennifer Phillips**, a Biochemistry and Molecular Biology student working on her thesis research in the lab of Jay Goodman received a travel award from the Regulatory and Safety Evaluation Specialty Section.
- **Chidozie Amuzie and Beckey Bae**, Food Science and Human Nutrition students working in the lab of James Pestka, also received travel awards.
- **Dina Shnaider and John Buchweitz**, both Pharmacology and Toxicology students training with Norbert Kaminski, received travel awards.

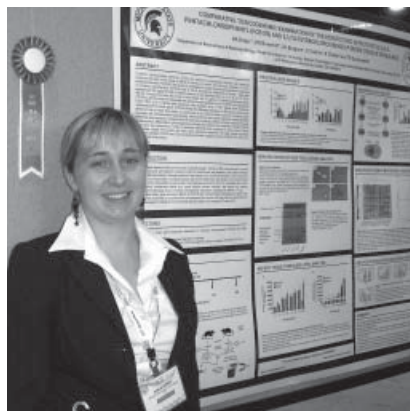
Research Associate Professor **Zahidul Islam**, who works in the lab of James Pestka in Food Science and Human Nutrition, was honored with an award for Best Publication of the Year from the SOT Occupation and Public Health Specialty Section.

The CIT again hosted an MSU Alumni and Friends reception. Dessert and coffee were served and many past and present MSU scientists attended.

## Atchison Lab

Mechanism of Pb-Induced Hypertension: Role of Ca<sup>2+</sup> Homeostasis. B. Atchison.

Protective Effects of Verapamil on Mercury Toxicity in *C. Elegans*. L. Koselke, C. Sam, R. Hajela, B. Atchison.



**This poster presented by Anna Kopec, Microbiology and Molecular Genetics, received an Honorable Mention Award in the Molecular Biology Specialty Section.**

Differential Effects of Ca<sup>2+</sup> Channel Alpha Subunits on Methylmercury-Induced Changes in ca<sup>2+</sup>I in HEK293 Cells. E.M. Sparkenbaugh, D. Atchison, R. Hajela, B. Atchison.

Both Ryanodine Receptor-Sensitive and Insensitive Intracellular Ca<sup>2+</sup> Pools Play a Role in Methylmercury (MeHg)-Induced Initial Stimulation of Spontaneous Inhibitory Synaptic Currents. W.D. Atchison, Y. Yuan.

Disruption of Intracellular Calcium Regulation in a Motorneuron Cell Line-NSC34 by Methylmercury. C. Dupre, K. Osterlund, R. Hajela, B. Atchison.

## Harkema/Kaminski Labs in Collaboration

Delta-9-Tetrahydrocannabinol Modulates Levels of Viral H1, Host Immune Cell Populations, and Airway Morphology in a Model of Host-Resistance to Influenza. J.P. Buchweitz, P.W. Karmaus, J.R. Harkema, K. Williams, N.E. Kaminski.

Characterization of the Host Immune Response to an Influenza Challenge in CB1/CB2 Receptor-Null Mice and C57Bl/6 Wild Type Mice Treated with Delta-9-Tetrahydrocannabinol (THC). P.W. Karmaus, J.P. Buchweitz, J.R. Harkema, N.E. Kaminski.

## **Harkema/Pestka Labs in Collaboration**

Kinetics of Nasal Inflammation and Neurotoxicity in Mice Exposed to Macrocytic Trichothecene Mycotoxin. Z. Islam, C.J. Amuzie, K.N. Corps, J.R. Harkema, J.J. Pestka.

Tissue Distribution and Pro-Inflammatory Cytokine Induction by the Trichothecene Deoxynivalenol in the Mouse: Comparison of Nasal vs. Exposure. C.J. Amuzie, J.R. Harkema, J.J. Pestka.

Deoxynivalenol Impairs Resistance to Respiratory Reovirus Infection and Promotes Viral Bronchopneumonia. M. Li, J.R. Harkema, C.F. Cuff, J.J. Pestka.

Repeated Intranasal Exposures to the Macrocytic Trichothecene Roridan A Evokes Olfactory Sensory Neuron Loss and Inflammation in the Murine Nose and Brain. J.R. Harkema, K.N. Corps, Z. Islam, J.J. Pestka.

Induction of Apoptosis in Neuronal PC-12 Cells by Satratoxin G from the Black Mold *Stachybotrys*: Role of Double-Stranded RNA-Activated Protein Kinase (PKR). J.J. Pestka, Z. Islam, J.R. Harkema.

Trichothecene-Induced Inflammation and Apoptosis: Cellular Targets and Molecular Mechanisms. J.J. Pestka, Z. Islam, J.R. Harkema, H. Bae, M. Li.



**Chidozie Amuzie, Food Science and Human Nutrition, gave an oral presentation. He received a travel award to attend the meet-**

## **Harkema/Wagner Labs in Collaboration**

Suppression and Enhancement of Allergic Airway Responses by PM2.5 is Dependent on Physicochemical Characteristics. J. Wagner, M. Morishita, G. J. Keeler, J.R. Harkema.

Integrating Pathology and Dosimetry to Assess the Toxicity of Inhaled Irritants. J.R. Harkema, S.A. Carey, J.G. Wagner.

## **Harkema/Zacharewski Labs in Collaboration**

Comparative Toxicogenomic Analysis of the Hepatotoxic Effects of TCDD in Sprague Dawley Rats and C57BL/6 Mice. C. Tashiro, D. Boverhog, L.D. Burgoon, B. Sharratt, B. Chittim, J. Harkema, D. Mendrick, T.R. Zacharewski.

## **Ganey/Roth Labs in Collaboration**

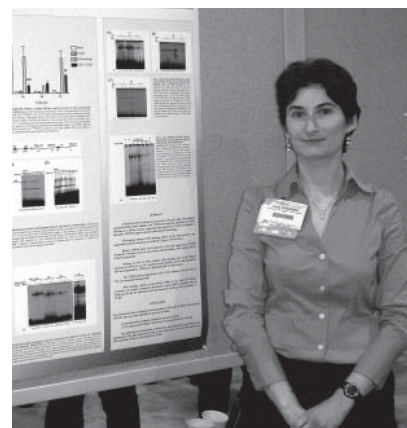
Co-Exposure of Mice to Trovafloxacin and Lipopolysaccharide Leads to an Altered Inflammatory Response in a Mouse Model of Idiosyncratic Liver Injury. P.J. Shaw, P.E. Ganey, R.A. Roth.

Hepatocellular Injury and Gene Expression Analysis in Livers of Rats Co-treated with Lipopolysaccharide and Chlorpromazine. W. Zou, S.S. Devi, L. Lecureux, L. Lehman-McKeeman, D. Nelson, R.A. Roth, P.E. Ganey.

Gene Expression Analysis of Livers from Rats Co-treated with Lipopolysaccharide and Aflatoxin B1. S.S. Devi, J.P. Luyendyke, M.J. Liguori, E.A. Blomme, J.F. Waring, P.E. Ganey, R.A. Roth.

Neutrophil Interaction with the Hemostatic System Contributes to Liver Injury in Rats Cotreated with Lipopolysaccharide and Ranitidine. X. Deng, J. Luyendyk, W. Zou, F. Tokov, J. Lu, E. Malle, P. Ganey, R. Roth.

Enhanced Hepatic Gene Expression of Stress-Response Factors in Rats with Dicyclofenac-Induced Hepatotoxicity: Role of GI Bacterial Endotoxin. M.J. Liguori, X. Deng, E. Blomme, R. Stachlewitz, J. Waring, J. Maddox, P. Ganey, R. Roth.



**Dina Shnaider, Pharmacology and Toxicology, received a travel award to attend the meeting. She is shown here with one of her poster presentations.**

## **Giesy Lab**

Use of the H295R Cell to Evaluate the Effect of Environmental Compounds on Steroid Hormone Production. A.R. Buckalew, J.W. Lakey, J.M. Goldman, E. B. Higley, J.P. Giesy, M. Hecker, R.L. Cooper.

## **Goodman Lab**

Epigenetics and Carcinogenesis: The Role of Altered DNA Methylation. J.I. Goodman.

Regions of Altered Methylation (RAMs) in Lung/Bronchi of Rats Exposed to Mainstream Tobacco Smoke (MTS). J.I. Goodman, J.M. Phillips, G.M. Curtin, D.J. Doolittle.

Identification of Genes that May Play a Key Role in Phenobarbital (PB)-Induced Mouse Liver Tumorigenesis Due to Altered DNA Methylation. J.M. Phillips, J.I. Goodman.

## **Kaminski Lab**

The Non-Psychoactive Cannabinoid, Cannabidiol, Suppresses T Cell Function Through Inhibition of Nuclear Factor of Activated T Cells (NFAT). B.L. Kaplan, N.E. Kaminski.

*Continued on page 6*

# Trainee News

## Graduate School Provides EITS Fellowships

The MSU Graduate Office recently partnered with the CIT to create the CIT Graduate School Dean Educational Enhancement Award. The award will provide fellowship funding to assist students in the CIT's Environmental and Integrative Toxicological Science training program.

The following five students will receive funding to continue their research this summer:

- **Steve Carey**, Comparative Medicine and Integrative Biology, is conducting his dissertation research with Jack Harkema on investigating the pathogenesis of toxicant-induced epithelial injury and repair within the respiratory system.
- **Josh Kwekel**, Biochemistry and Molecular Biology, will continue his investigations in the lab of Tim Zacharewski in the area of estrogenic endocrine disruptors.
- **Peer Karmaus**, Cell and Molecular Biology, is conducting his dissertation research with Norb Kaminski, investigating the molecular mechanisms responsible for cannabinoid-mediated immunotoxicity and increased susceptibility to influenza.
- **Laura Vines**, Food Safety and Human Nutrition, will continue her dissertation research in the lab of James Pestka, investigating the molecular mechanisms by which polyunsaturated fatty acids modulate the immune system response to inflammagenic toxins.
- **Laura Harris**, Cell and Molecular Biology, will continue investigations in Susan Conrad's lab, in the general area of gene therapy. Harris will also receive a fall 2007 stipend.

Ten students also received assistance to travel to national meetings. Of those, eight students participated in the Society of Toxicology Meeting in March. One student participated in the Environmental Biology Society meeting; and an additional student attended the American Thoracic Society meeting. One additional student received funding to participate in a Gordon Research Conference this summer.

Norb Kaminski, CIT director, noted that the graduate school funding has been and continues to be an important resource in providing the

best training experience possible to students for multi-disciplinary careers in toxicology. It is especially critical that our trainees have the opportunity to attend and present their research at regional and international meetings, he said.

"This funding not only allows many of our graduate students to enhance their training experiences, but also demonstrates MSU's commitment to maintaining excellence in our program. The Graduate School has been most helpful in making this possible." Kaminski said.

## EITS Visting Scholar Recruitment Trip

The Environmental and Integrative Toxicological Sciences Graduate Program is strongly committed to the recruitment of outstanding trainees. Toward this end, Steve Carey, an EITS doctoral student, recently represented the CIT at a Research Careers Fair at Elizabeth City State University in Elizabeth City, North Carolina.

Notably, the CIT received partial funding to help defray the cost for Carey's visit from the Society of Toxicology's Committee on Diversity Initiatives as part of the Toxicology Scholar Visit Program. Funding by the Society of Toxicology was due to Professor Bob Roth's efforts in preparing and submitting a proposal to the SOT for funding for the recruiting trip.

The Research Fair was part of ECSU's "Research Week 2007", designed to enhance academic instruction through research. This event also celebrated the scientific accomplishments of African-Americans, historically Black colleges and universities, and others in mathematics, science, and technology. Representatives from state and federal agencies, graduate schools, and professional schools, presented information about student internships, graduate programs, and research collaboration.

Carey also had a unique opportunity to address a group of juniors and seniors in an upper level microbial biochemistry class. He presented an informal seminar entitled, Air Pollution and Water Damage, Right Up Your Nose (And Into Your Brain?).

He provided a brief introduction to toxicology and discussed the pervasiveness of toxicology in everyday life.



**Steve Carey represented the MSU Environmental and Integrative Toxicological Sciences training program at a research career event at Elizabeth City State University in North Carolina.**

He also discussed the importance of toxicology research in the protection of human and animal health and the preservation of the environment.

As an example, he included a discussion of ongoing respiratory pathobiology and toxicology research at MSU, including his current thesis research on the effects of ozone on the developing respiratory tract. He concluded with a description of the EITS program at MSU.

Carey earned his DVM degree from the University of Wisconsin-Madison and is currently a dual major student in the CIT's EITS training program and the Comparative Medicine and Integrative Biology program. He is conducting his research in the lab of Dr. Jack Harkema.

## SOT meeting, continued from page 5

A Putative Role of Blimp-1 and AP-1 in TCDD-Induced Suppression of the IgM Response in B Cells. D. Shnaider, B.D. Yoo, N.E. Kaminski.

### **Pestka Lab**

Binding of the Macrocyclic Trichothecene Satrotoxin G to Ribosomes in Raw 264.7 Macrophages and PC-12 Neuronal Cells. H. Bae, Z. Islam, J.J. Pestka.

Ribosome-Mediated Stress Response to Biological Toxins in the Macrophage. J.J. Pestka, H.B. Bae, M. Li.

Docosahexaenoic Acid Consumption Suppresses Multiple CREB Phosphorylation Pathways in Murine Peritoneal Macrophages. Y. Shi, J.J. Pestka.

### **Trosko/Upham Labs in Collaboration**

Novel Proteomic Approach to Mapping Signaling Pathways Induced by Specific Isomers of Methylated Anthracenes. B.L. Upham, D.A. Whitten, C.G. Wilkerson, J.E. Trosko, L. Blaha.

Development of an Assay System for Simple and Easy Determination of Cell Differentiation in Well-Differentiated Human Colon Cancer Cells. Y. Nakamura, Y. Nakayama, E. Park, K. Sato, B.L. Upham, C. Cheng, J.E. Trosko.

### **Zacharewski Lab**

Comparative Toxicogenomics of TCDD-Mediated Hepatic Responses: Evidence for Species-Specific AhR Regulons. T. Zacharewski.

Assessing AhR-Mediated Gene Expression Effects in a Novel Human Liver Adult Stem Cell Line. S. Kim, E. Dere, L.D. Burgoon, C.C. Chang, T.R. Zacharewski.

Metabolomic Analyses of Lipid and Aqueous Liver Extracts in TCDD-Treated Mice. M. Kent, N.V. Reo, J.L. Gary, N. DelRaso, D. Boverhof, L. Burgoon, D. Jump, T. Zacharewski.

Comparative Toxicogenomics of Ah Receptor Mediated Hepatotoxicity in C57BL/6 Mice. A N'jai, D. Boverhof, L. Burgoon, E. Dere, Y. Tan, J.C. Rowlands, R. Budinsky, K. Stebbins, T. Zacharewski.

Comparative Toxicogenomic Examination of the Hepatotoxic Effects of 3, 3', 4, 4',5-Pentachlorobiphenyl (PCB126) and 2,3,7,8-Tetrachlorodibenzo-P-Dioxin (TCDD) in C57BL/6 Mice. A.K. Kopec, D.R. Boverhof, L.D. Burgoon, C. Tashiro, B. Chittim, T.R. Zacharewski.

Comparative Microarray Analysis of Toxic and Non-toxic Arylhydrocarbon Receptor Ligands in Murine Hepa1C1C7 Hepatoma Cells. M.S. Kiewitt, E. Dere, S.S. Lundback, L.D. Burgoon, T.R. Zacharewski.

Comparative Analysis of Global Gene Expression Responses Elicited by TCDD in Human Hepg2, Mouse Hepa1C1C7 and Rat H4IIE Cell Lines. E. Dere, A.S. Harney, S.S. Proper, L.D. Burgoon, T.R. Zacharewski.

In Vivo Genome-Wide Location Analysis of TCDD-Mediated Promoter Binding of the Aryl Hydrocarbon Receptor in C57BL/6 Hepatic Tissue. J.W. Burt, T.R. Zacharewski.

Comparative Analysis of the Genomic Binding Locations of the Aryl Hydrocarbon Receptor and the Aryl Hydrocarbon Receptor Nuclear Translocator in TCDD Treated Hepa-1C1C7 Cells. P. Griffin, J.W. Burt, T.R. Zacharewski.

Cross-Species Comparison of Tamoxifen & Estrogen Induced Uterotrophy in Rodents. J.C. Kwekel, C.J. Fong, L.D. Burgoon, T.R. Zacharewski.

Comparative Analysis of Temporal Gene Expression, Morphometry and Uterotrophy in *o,p'*-DDT and Ethynylestradiol Treated Rats. A.L. Forgacs, J.C. Kwekel, L.D. Burgoon, T.R. Zacharewski.

Automated Quantitative Toxicogenomic Dose-Response Modeling. L.D. Burgoon, D.R. Boverhof, T.R. Zacharewski.



**CIT Director Norb Kaminski (left) was presented with a plaque from Dr. James Popp, the outgoing SOT President to thank him for his service as the SOT Treasurer.**

Development of a NMR-based Metabolomic Analysis Methodology for Toxicology. G.L. Jahns, N.V. Reo, M. Kent, D.R. Boverhof, L.D. Burgoon, N. DelRaso, T.R. Zacharewski.

Can Species and Strain Differences in Dioxin Sensitivity be Explained by Differences in the Ah Receptor? J. Rowlands, T.R. Zacharewski.

Inhibition of Estrogen-Mediated Gene Expression Responses by Dioxin in the Uteri of C57BL/6 Mice. D. R. Boverhof, J.C. Kwekel, L.D. Burgoon, K. J. Williams, T.R. Zacharewski.

Divergent Transcriptional Profiles Induced by the AhR Agonists 2,3,7,8-TCDD, 2,3,7,8-TCDF and 2,3,4,7,8-PeCDF in Primary Rat Hepatocytes. B. Gollapudi, R. Budinsky, A. Dombkowski, R. Novak, M.A. Abdelmegeed, T.R. Zacharewski.

Tamoxifen and Ethynylestradiol Co-treatment in C57BL/6 Mouse Uterus: Gross, Morphometric and cDNA Microarray Gene Expression Analysis. C.J. Fong, L.D. Burgoon, K.J. Williams, A.L. Forgacs, T.R. Zacharewski.



## Grants/Contracts Received by CIT Faculty Affiliates

# Over 3 Million Accepted by MSU Board

**F**aculty affiliated with the CIT had the following grants and contracts totaling \$3,381,466 accepted by the MSU Board of Trustees at their February and April meetings:

**William Atchison** received \$329,897 from the National Institutes of Health for “Murine Models of Presynaptic Neuromuscular Disease.”

**Allison Bauer** received \$107,440 from the National Institute of Environmental Health Science for “The Role of Toll-Like Receptor 4 in O3-Induced Lung Inflammation and Injury.”

**Leslie Bourquin** received \$117,810 from the Michigan Department of Agriculture for “Coordinated Consumer Food Safety Education Programs for Michiganians.”

**Syed Hashsham** and **James Tiedje** received \$966,608 from the Michigan Economic Development Corporation for “A PCR-CHP for Simultaneous Detection of 50 Threat Agents Relevant to Air and Water Safety.”

**Colleen Hegg** received \$215,201 from the National Institutes of Health for “Injury-Evoked Regeneration Mechanism in Olfactory System.”

**Robert Hollingworth** received \$49,167 from Rutgers State University for “IR-4 Field Research.”

**Norbert Kaminski** received \$248,068 from the National Institutes of Health for “CB1/CB2 Dependent and Independent T Cell Modulation.”

**John Kaneene** received \$63,334 from the Michigan Department of Community Health for “Michigan-Stride System to Report Integrated Disease Events: 2007.”

**David Long** and **John Giesy** received \$473,594 from the Michigan Department of Environmental Quality for “A Strategic Environmental Quality Monitoring Program for Michigan Surface Waters: The Inland Lakes Sediment.”

**Thomas Mullaney** received \$50,000

from the U.S. Department of Agriculture for “NAHLIN: Michigan.”

**L. Karl Olson** received \$5,000 from Complegen, Inc. for “Effect of CDK5 Inhibitor on Glucose-Induced Insulin Release.”

**James Pestka** received \$246,129 from the National Institutes of Health for “Dietary Lipids and Experimental IGA Nephropathy.”

**Ken Rosenman** received \$389,273 from the Center for Disease Control for “Enhanced Program in Occupational Injury and Illness Surveillance.” Rosenman also received \$50,000 from the Michigan Department of Community Health for “State-Wide Asthma Mortality Review”; and \$10,000 from the MDCH for “The Work-Related Asthma Education Project.”

**Bruce Uhal** received \$26,000 from the American Heart Association for “Regulation of Angiotensinogen Gene Expression by Transforming Growth Factor-Beta 1 in Lung Fibroblasts.”

**James Wagner** and **Jack Harkema** received \$282,013 from the University of North Carolina for “Preclinical Evaluation of CAM Therapies for Asthma (Project 2).”

