

# **Thirty-fourth Annual Meeting of the Neurobehavioral Teratology Society**

Held in Conjunction with the 50<sup>th</sup> Annual Meeting of the Teratology Society and the 23<sup>rd</sup> Annual Meeting of the Organization of Teratology Information Specialists

Marriott Louisville Downtown  
Louisville, Kentucky, USA  
June 26–June 30, 2010

## **2010 RICHARD BUTCHER NEW INVESTIGATOR AWARD**

Dominik Biezonski (Nominated by Jerrold Meyer)  
University of Massachusetts  
Effects of 3,4-Methylenedioxymethamphetamine (MDMA) on Serotonin Transporter and Vesicular Monoamine Transporter 2 Protein and Gene Expression in Rats: Implications for MDMA Neurotoxicity

## **NBTS CONFERENCE AWARDS**

Aliya Frederick (Nominated by Gregg Stanwood)  
Vanderbilt University  
Molecular (mal)adaptations in dopamine-modulated signaling pathways following neurodevelopmental insult

Damiyon Sledge (Nominated by Edward D. Levin)  
North Carolina Central University  
Early Developmental Chlorpyrifos Causes Persisting Behavioral and Neurochemical Changes in Zebrafish

## **SOT NEUROTOXICOLOGY SPECIALITY SECTION CONFERENCE AWARD**

Kate Sali (Nominated by Robert Tanguay)  
Oregon State University  
Developmental Neurobehavioral Toxicity of Bisphenol A: Defining the Role of Estrogen Related Receptor Gamma

## **BEHAVIORAL TOXICOLOGY CONFERENCE AWARD**

Devon Graham (Nominated by Michael Williams)  
University of Cincinnati  
The Long-term Behavioral Effects of Exposure to Metals and Chronic Stress during Development

## NBTS 2010 PROGRAM

### Saturday, June 26, 2010

- 8:00 a.m.-11:30 a.m. Teratology Society Education Course\*: *Marriott Ballroom 6*  
12:30 a.m.-5:30 p.m. Teratology Society/OTIS Pregnancy Workshop\*: *Marriott Ballroom 9*  
1:30 p.m.-4:45 p.m. Teratology Society Education Course\*: *Marriott Ballroom 6*  
\*Separate Registration through the Teratology Society required  
1:00 p.m.-5:00 p.m. NBTS Registration: *Marriott Ballroom 7 Foyer*  
1:00 p.m.-2:00 p.m. NBTS Public Affairs Committee: *Filly Meeting Room*  
2:00 p.m.-3:00 p.m. NBTS Publications Committee Meeting: *Filly Meeting Room*  
3:00 p.m.-6:00 p.m. NBTS Council Meeting: *Filly Meeting Room*

### Sunday, June 27, 2010

- 8:00 a.m.-5:00 p.m. NBTS Registration: *Marriott Ballroom 7 Foyer*  
  
7:45 a.m.-8:15 a.m. Continental Breakfast: *Marriott Ballroom 7*  
  
8:15 a.m.-8:30 a.m. **President's Welcome and Official Opening of 2010 NBTS Meeting**  
*Marriott Ballroom 7*  
  
8:30 a.m.-12:00 a.m. **Session 1, Behavioral Toxicology Symposium,**  
**Behavioral Toxicology of Cognition: Extrapolation from Experimental**  
**Animal Models to Humans**  
Chairperson: Merle Paule, National Center for Toxicological Research  
*Marriott Ballroom 7*

8:30-8:50 Introduction  
Merle Paule  
National Center for Toxicological Research, Jefferson, AR

8:50-9:25 Delay Discounting by Humans and Other Animals: Does the Species Matter?  
Leonard Green  
Washington University, St. Louis, MO

9:25-10:00 The Use of "Animal" Tests of Cognition in Children  
William H. Overman  
University of North Carolina, Wilmington, NC

10:00-10:15 Break

10:15-10:50 Modeling the Cognitive Deficits of Parkinson's Disease  
Jay Schneider  
Thomas Jefferson University, Philadelphia, PA

10:50-11:25 Delineating Behavioral Domains Underlying Lead-Induced Cognitive Deficits  
Deborah Cory-Slechta  
University of Rochester Medical School, Rochester, NY

11:25-12:00 Perinatal PCB Exposure and Deficits In Inhibitory Control: Parallels Between  
Animals And Humans  
Susan Schantz  
University of Illinois, Urbana IL

12:00 p.m.-1:20 p.m. **Lunch on your own**

1:20 p.m.-3:00 p.m. **Session 2, NBTS Platform Talks: Marriott Ballroom 7**  
Chairperson: Phillip Bushnell, US-Environmental Protection Agency

1:20 p.m.-1:40 p.m. The Effect of 2,4-Dichlorophenoxyacetic Acid on Anxiety in the Rat.  
William Hamlet, Sandra McFadden, Russell Morgan, Amy Vaught  
Western Illinois University, Macomb, IL

1:40 p.m.-2:00 p.m. Prenatal Exposure to Phthalates and Newborn Neurobehavior  
Kimberly Yolton, Yingying Xu, Jane Khoury  
Cincinnati Children's Hospital, Cincinnati, OH

2:00 p.m.-2:20 p.m. Early Developmental Chlorpyrifos Causes Persisting Behavioral and  
Neurochemical Changes in Zebrafish  
Damiyon Sledge, Ann Petro, Jerry Yen, Susan Donerly, Elwood Linney, Edward Levin  
Duke University Medical Center, Durham, NC

2:20 p.m.-2:40 p.m. Reversal of Chlorpyrifos Neurobehavioral Teratogenicity in Mice by Adult  
Allographic Subventricular Zone-derived Neural Stem Cell Transplantation  
Joseph Yanai<sup>1,2</sup>, Adi Pinkas<sup>1</sup>

<sup>1</sup>The Ross Lab for Studies in Neural Birth Defects, Department of Medical Neurobiology, IMRIC,  
Hebrew University-Hadassah Medical School, Jerusalem, Israel, <sup>2</sup>Department of Pharmacology  
and Cancer Biology, Duke Medical School, Durham, NC

2:40 p.m.-3:00 p.m. The Long-term Behavioral Effects of Exposure to Metals and Chronic Stress  
during Development

Devon Graham<sup>1,2</sup>, Robyn Amos-Kroohs<sup>1,2</sup>, Amanda Braun<sup>1,2</sup>, Curtis Grace<sup>1,2</sup>, Tori Schaefer<sup>1,2</sup>,  
Matthew Skelton<sup>1,2</sup>, Charles Vorhees<sup>1,2</sup>, Michael Williams<sup>1,2</sup>

<sup>1</sup>Cincinnati Children's Research Foundation, <sup>2</sup>University of Cincinnati, Cincinnati, OH

3:00 p.m.-3:20 p.m. Break: *Marriott Ballroom 7 Foyer*

3:20 p.m.-5:00 p.m. **Session 3, NBTS Platform Talks: Marriott Ballroom 7**  
Chairperson: Lori Driscoll, Colorado College

3:20 p.m.-3:40 p.m. Effects of 3,4-Methylenedioxymethamphetamine (MDMA) on Serotonin Transporter and Vesicular Monoamine Transporter 2 Protein and Gene Expression in Rats: Implications for MDMA Neurotoxicity

Dominik Biezonski<sup>1,2</sup>, Jerrold Meyer<sup>1</sup>

<sup>1</sup>University of Massachusetts, Amherst, MA, <sup>2</sup>Harvard Medical School, Southborough, MA

3:40 p.m.-4:00 p.m. Effects of Prenatal Cocaine on Conditioned Place Preference in Adolescence: Modification by Post-weaning Housing and Sex

Diana Dow-Edwards<sup>1</sup>, Sari Izenwasser<sup>1</sup>

<sup>1</sup>State University of New York, Brooklyn, NY, <sup>2</sup>University of Miami School of Medicine, Miami, FL

4:00 p.m.-4:20 p.m. Evidence for Rapid Sensitization to the Stimulant Effects of MDMA in Adolescent Rats

Jerrold Meyer, Peter Kim, Frederico Fernandes, Dominik Biezonski, Brian Piper

University of Massachusetts, Amherst, MA

4:20 p.m.-4:40 p.m. Methylphenidate-Induced Developmental Neurobehavioral Toxicity in Zebrafish

Edward Levin, Damiyon Sledge, Stephanie Roach, Susan Donerly, Elwood Linney

Duke University, Durham, NC

4:40 p.m.-5:00 p.m. Effects of Overlapping Ages of Exposure to (+)-Methamphetamine (MA) in Rats on Later Allocentric and Egocentric Learning

Charles Vorhees, Matthew Skelton, Devon Graham, Tori Schaefer, Curtis Grace, Amanda Braun, Robyn Amos-Kroohs, Michael Williams

Cincinnati Children's Hospital Medical Center, Cincinnati, OH

6:00 p.m.-8:00 p.m. **Joint NBTS/TS/OTIS Welcome Reception: *Marriott Ballroom 1***

**Monday, June 28, 2010**

8:00 a.m.-5:00 p.m. NBTS Registration: *Marriott Ballroom 7 Foyer*

7:45 a.m.-8:15 a.m. Continental Breakfast: *Marriott Ballroom 7*

8:15 a.m.-9:00 a.m. **Session 4, Elsevier Distinguished Lectureship**

Bisphenol-A Impacts on Sex Differences in Neural Processes

Neil MacLusky, University of Guelph, ON

*Marriott Ballroom 7*

9:15 a.m.-11:45 a.m. **Session 5, Reproductive Psychiatry Symposium (NBTS/OTIS/TS)**

Chairpersons: Katherine L. Wisner, University of Pittsburgh Medical Center and Adrienne Einarson, The Motherisk Program

*Marriott Ballroom 6*

9:15 a.m.–9:20 a.m. Introduction

9:20 a.m.–9:50 a.m. Where Does Neonatal Behavioral Syndrome End and Neurobehavioral Teratogenicity Begin?

Tim F. Oberlander, University of British Columbia, Vancouver, BC

9:50 a.m.–10:20 a.m. Messages from the Womb: Maternal Antidepressant Use and Fetal Neurobehavior

Amy L. Salisbury, Alpert Medical School of Brown University, Providence, RI

10:20 a.m.–10:50 a.m. An Update on Lithium Treatment during Pregnancy and Lactation

Adele C. Viguera, Neurological Institute, Cleveland Clinic, Cleveland, OH

10:50 a.m.–11:20 a.m. Effects of Developmental Exposure to Methylphenidate on Brain Areas Involved in Cognition, Motivated Behaviors, Appetite and Stress

Teresa Ann Milner, Weill Cornell Medical College, New York City, NY

11:20 a.m.–11:45 a.m. Discussion: How Do We Incorporate These Data into Human Risk Assessment?

Katherine L. Wisner, University of Pittsburgh Medical Center, Pittsburgh, PA

12:00 p.m.-1:15 p.m. **Lunch on your own**

1:15 p.m.-4:45 p.m. **Session 6, Symposium**

**Complementary Zebrafish Models for Neurobehavioral Teratology Research: Opportunities and Challenges**

Chairperson: Edward D. Levin, Duke University Medical Center

*Marriott Ballroom 7*

1:15 p.m.-1:45 p.m. Embryonic Exposure to Low Levels of Alcohol: Towards the Development of a Realistic Zebrafish Model of Fetal Alcohol Syndrome

Robert Gerlai, University of Toronto, Toronto, ON

1:45-2:15 Ethanol-induced Effects on Neurobehavioral Function: the Developmental Neurotoxicity of MicroRNAs

Tamara Tal, Katerine Sali, Jill Franzosa, Robert Tanguay

Oregon State University, Corvallis, OR

2:15 p.m.-2:45 p.m. Do NMDA Receptor Antagonists Alter Structural and Functional Development in Zebrafish?

Frank Scalzo

Bard College, Annandale-on-Hudson, NY

2:45 p.m.-3:00 p.m. Break: *Marriott Ballroom 7 Foyer*

3:00 p.m.-3:30 p.m. Evaluating the Behavioral Impact of Toxicants in Larval Zebrafish

Robert MacPhail  
US Environmental Protection Agency, Research Triangle Park, NC

3:30 p.m.-4:00 p.m. Using the Zebrafish (*Danio rerio*) Model to Investigate Changes in Gene Expression and Behavior following Developmental Exposure to Pyrethroid Pesticides  
Lori White<sup>1</sup>, Keith Cooper<sup>1</sup>, Amy DeMicco<sup>1</sup>, Jason Richardson<sup>2</sup>  
<sup>1</sup>Rutgers, The State University of NJ, New Brunswick, NJ, <sup>2</sup>Environmental and Occupational Health Sciences Institute, UMDNJ, Piscataway, NJ

4:00 p.m.-4:30 p.m. Using Zebrafish to Investigate Persisting Cognitive and Sensorimotor Effects of Early Developmental Chlorpyrifos Exposure  
Edward D. Levin  
Duke University Medical Center, Durham, NC

4:30-4:45 Discussion

5:00 p.m.-7:00 p.m. **Joint Poster Session I (NBTS/TS/OTIS) and Exhibits Open** (Posters set up at 11:45 a.m., attended 5:00 – 7:00 p.m.)  
*Marriott Ballroom 1*

Neurobehavioral Development following Exposure of Male Mice to Polybrominated Diphenyl Ether 47 on Postnatal Day 10  
Virginia Moser<sup>1</sup>, Pamela Phillips<sup>1</sup>, Katherine McDaniel<sup>1</sup>, Jill Gee<sup>1,2</sup>  
<sup>1</sup>US Environmental Protection Agency, Research Triangle Park, NC, <sup>2</sup>North Carolina State University, Raleigh, NC

Subsequent Effects on Open-field Responses of Exposing Male and Female Hooded Rats Each Day to Alcohol, Caffeine and their Combination during Early and Mid to Late Adolescence, and Early Adulthood.  
Rob Hughes  
University of Canterbury, Christchurch, New Zealand

Gene Expression in Developing Brain is Altered by Modest Reductions in Circulating Levels of Thyroid Hormone.  
Mary Gilbert, Kevin Crofton, Gail Nelson, Jeremy Knapp  
US Environmental Protection Agency, Research Triangle Park, NC

Molecular (Mal)adaptations in Dopamine-modulated Signaling Pathways following Neurodevelopmental Insult  
Aliya Frederick, Roger Colbran, Gregg Stanwood  
<sup>4</sup>Vanderbilt University, Nashville, TN

Effects of Methylphenidate on Motivation in Children with Attention-Deficit/Hyperactivity Disorder  
John Chelonis<sup>1,2</sup>, Teresa Johnson<sup>2</sup>, Sherry Ferguson<sup>1,2</sup>, Brian Kubacak<sup>2</sup>, Mark Edwards<sup>2</sup>, Merle Paule<sup>1,2</sup>

<sup>1</sup>National Center for Toxicological Research, FDA, Jefferson, AR, <sup>2</sup>University of Arkansas for Medical Sciences/Arkansas Children's Hospital, Little Rock, AR

Effect of Lifetime Exposure to Acrylamide on Motor Nerve Conduction Velocity in Rats at One Year of Age

Joan Garey<sup>1</sup>, Zbigniew Binienda<sup>2</sup>, Merle Paule<sup>2</sup>

<sup>1</sup>SRC, Inc, Arlington, VA, <sup>2</sup> National Center for Toxicological Research, FDA, Jefferson, AR

Binge cocaine during pregnancy in the rat

Diana Dow-Edwards

State University Of New York, Brooklyn, NY

Ontogeny of Hippocampal-Dependent Memory processes: Developmental Amnesia in Monkeys and Humans

Maria C. Alvarado, and Jocelyne Bachevalier

Yerkes National Primate Research Center, Emory University, Atlanta, GA, United States

**Tuesday, June 29, 2010**

8:00 a.m.-5:00 p.m. NBTS Registration: *Marriott Ballroom 7 Foyer*

7:45 a.m.-8:15 a.m. Continental Breakfast: *Marriott Ballroom 7*

8:30 a.m.-9:15 a.m. **Special Lecture (NBTS/TS/OTIS)**

Children's Environmental Health: A Good Start Lasts a Lifetime

Linda S. Birnbaum, National Institute of Environmental Health Sciences

*Marriott Ballroom 6*

9:30 a.m.-12:00 p.m. **Session 7, Symposium (NBTS/TS)**

**Advancing Neurodevelopmental Evaluation in Children:  
An Interdisciplinary Approach**

Chairperson: Susan Makris, US Environmental Protection Agency

*Marriott Ballroom 6*

9:30 a.m.-9:55 a.m. The Use of Neurodevelopmental Data in Children for Risk Assessment of Environmental Chemicals

Susan Makris, Ambuja Bale, Kathleen Raffaele, US Environmental Protection Agency, Washington, DC

9:55 a.m.-10:20 a.m. A Multidisciplinary Approach to Advancing the Science of Neurodevelopmental Testing in Cohorts of Infants and Young Children

Judy S. LaKind, LaKind Associates, LLC, Baltimore, MD

10:20 a.m.-10:45 a.m. How to Get the Biggest Bang for Your Buck: Choosing Neurodevelopmental Tests that Maximize Power

Lauren Kenworthy, George Washington University Medical School, Washington, DC

10:45 a.m.–11:10 a.m. Threats to Study Validity: The Flynn Effect, Examiner Drift, Confounders, Lost in Translation, and Other Important Considerations

Laura Gutermuth Anthony, George Washington University School of Medicine, Washington, DC

11:10 a.m.–11:35 a.m. Weight-of-the-Evidence Assessment in Neurodevelopmental Epidemiology: A Plea for Consistency

Michael Goodman, Emory University, Atlanta, GA

11:35 a.m.–12:00 p.m. Panel Discussion

12:00 p.m.–2:00 p.m. **NBTS/TS Joint Lunchtime Poster Session II and Exhibits Open** (Posters set up at 11:45 a.m., attended 12:00 – 2:00 p.m.)

*Marriott Ballroom 1*

Acute Postnatal Exposure to the PentaBDE Commercial Mixture DE-71 at Low Doses (5 or 15 mg/kg/day) Does Not Produce Learning or Attention Deficits in Rats

Lori Driscoll

Colorado College, Colorado Springs, CO

Gene-toxicant Interactions: Developmental PBDE Effects on the Behavioral Phenotype of the Mecp2-308 Rett Syndrome Mouse Model

Mari Golub, Roxanne Vallero, Joanne Suarez, Ta Tram Anh, Isaac Pessah, Robert Berman, Janine LaSalle

University of California Davis, Davis, CA

Locomotor Responding in Adolescent CD-1 Mice following Acute and Chronic Cocaine Administration is Unaffected by Low Dose Perinatal Bisphenol A Exposure

Jenna Nelms, Abby Meyer, Mellessa Miller, Melissa Ward, Helen Sable

University of Memphis, Memphis, TN

Developmental Neurobehavioral Toxicity of Bisphenol A: Defining the Role of Estrogen Related Receptor Gamma

Katerine Saili, Jane LaDu, Michael Simonich, Robert Tanguay

Oregon State University, Corvallis, OR

Evidence of Locus Coeruleus Involvement in Cocaine-Induced Behavioral Sensitization

Sonya Sobrian<sup>1</sup>, Shannan White<sup>1</sup>, Lalla Mahaman<sup>1,2</sup>, Sheree Johnson<sup>1,2</sup>

<sup>1</sup>Howard University College of Medicine, Dept. Pharmacology, Washington, DC, United States, <sup>2</sup>Howard University college of Medicine, Dept. Physiology and Biophysics,

Washington, DC

Developmental Bisphenol A treatment at relatively low doses has no effects on anogenital distance (AGD), birthweight or hormonal measures in Sprague-Dawley rats at weaning.

Sherry Ferguson<sup>1</sup>, Charles Law<sup>1</sup>, Jordan Abshire<sup>1</sup>, Ralph Patton<sup>2</sup>

<sup>1</sup>Natl Center Toxicol Res, Jefferson, AR, United States, <sup>2</sup>Toxicologic Pathology Associates, Jefferson, AR

2:00 p.m.-3:40 p.m. **Session 8, NBTS Platform Talks: Marriott Ballroom 7**

Chairperson: Diana Dow-Edwards, Downstate Medical Center, Brooklyn, NY

2:00 p.m.-2:20 p.m. Genetic Susceptibility to PCB-induced Motor Dysfunction

Chris Curran, Emily Altenhofen, Amber Evans, Rikki Floyd, Cellestine Kamau-Cheggeh, Sarah Kraemer, Breann Hays, Kristi Haik  
Northern Kentucky University, Highland Heights, KY

2:20 p.m.-2:40 p.m. Assessment of Prefrontal Cortical Functions in Mice with Genetic and Dietary Alterations of Folate Status

Jessica Ash, Barbara Strupp  
Cornell University, Ithaca, NY

2:40 p.m. -3:00 p.m. Behavioral Outcome in Children Exposed Prenatally to Lamotrigine, Valproate, or Carbamazepine: Increased Risks for Valproate

Uma Deshmukh<sup>1</sup>, Jane Adams<sup>2</sup>, Ruby Dhillon<sup>1</sup>, Katherine McCarthy<sup>1</sup>, Eric Macklin<sup>1</sup>, Lewis Holmes<sup>1,3</sup>

<sup>1</sup>Massachusetts General Hospital, Boston, MA, <sup>2</sup>University of Massachusetts Boston, Boston, MA, <sup>3</sup>Harvard Medical School, Boston, MA

3:00 p.m.-3:20 p.m. Effects of Age of Exposure to 3,4-Methylenedioxymethamphetamine (MDMA) in Rats on Later Learning and Behavior

Charles Vorhees, Matthew Skelton, Devon Graham, Tori Schaefer, Curtis Grace, Amanda Braun, Michael Williams  
Cincinnati Children's Hospital Medical Center, Cincinnati, OH

3:20 p.m.-3:40 p.m. Predicting the Acute Behavioral Effects in Rats Inhaling Toluene for Up to 24 hrs: Inhaled vs. Internal Dose Metrics and Tolerance.

WM Oshiro, QT Krantz, CJ Gordon, EM Kenyon, and PJ Bushnell  
US Environmental Protection Agency, Office of Research and Development, National Health Effects and Environmental Research Laboratory, Research Triangle Park, NC

3:40 p.m.-4:00 p.m. Neurobehavioral Outcome in Mice Exposed In Utero to Chlorpyrifos

Thomas M. Burbacher, Toby B. Cole, Jenna Fisher, Sarah Park, Sungwoo Hong, William C. Griffith, Elaine M. Faustman,  
Department of Environmental and Occupational Health Sciences, School of Public Health, University of Washington, Seattle, WA USA

4:00 p.m.-4:15 p.m. Break: *Marriott Ballroom 7 Foyer*

4:15 p.m.-5:30 p.m. **Annual NBTS Business Meeting:** *Marriott Ballroom 7*

6:00 p.m.-7:30 p.m. **Testimonial for Jane Adams, Editor-in-Chief of Neurotoxicology and Teratology** *Marriott Ballroom 7*

**Wednesday, June 30, 2010**

7:30 a.m.-9:00 a.m. Continental Breakfast: *Marriott Ballroom 7*

9:00 a.m.-10:45 a.m. **Session 9, Future Directions in Neurobehavioral Teratology Roundtable**  
Discussants: Philip Landrigan, Jerrold Meyer, Susan Schantz, Lynn Singer,  
Charles Vorhees,  
*Marriott Ballroom 7*

10:45 a.m.-11:00 a.m. Break: *Marriott Ballroom 7 Foyer*

11:00 a.m.-12:00 p.m. **Session 10, National Children's Study Panel (NBTS/TS)** *Marriott Ballroom 6*

12:00 p.m. **NBTS 2010 Formally Adjourned**