



Thirty-Seventh Annual Meeting of the Neurobehavioral Teratology Society
Held in Conjunction with the 53rd Annual Meeting of the Teratology
Society and the 26th Annual Meeting of the Organization of
Teratology Information Specialists
Loews Ventana Canyon Resort, Tucson, AZ,
June 22–26, 2013

2013 RICHARD BUTCHER NEW INVESTIGATOR AWARD

Patricia Janulewicz (nominated by Jane Adams)

Boston University

Early Postnatal Exposure to Tetrachloroethylene (PCE)-contaminated Drinking Water

NBTS CONFERENCE AWARDS

Kaitlyn Maier (nominated by Sherry Ferguson)

National Center for Toxicological Research

Methylphenidate Treatment Does Not Alter Novel Object Recognition in Male and Female Rats

Ju Young (Julie) Park (nominated by Elaine Faustman)

University of Washington

Prenatal Exposure Effects of Repeated Oral Dose of Domoic Acid (DA) on Neurobehavior in Mice

Kristin Sonon (nominated by Gale Richardson)

University of Pittsburgh

Prenatal Marijuana Exposure Predicts Marijuana Use in Offspring during Young Adulthood

Smitha Infante (nominated by Christine Curran)

Northern Kentucky University

Trans-generational Behavioral Effects of Neonatal Hypoxia–Ischemia in Rat Progeny

NBTS 2013 PROGRAM

Saturday, June 22, 2013

8:00 AM–12:00 PM

Teratology Society Education Course Session I—Salon B
(separate registration required)
Principles of Teratology

1:00 PM–4:30 PM

Teratology Society Education Course Session II—Salon B
(separate registration required)
Advance Technologies in Prenatal and Postnatal Screening and Diagnosis from Basic Science to Clinical Application

12:00 PM–5:00 PM

NBTS Registration—Grand Ballroom Foyer

1:00 PM–2:00 PM

NBTS Public Affairs Committee Meeting—Sonora Room

2:00 PM–3:00 PM	NBTS Publications Committee Meeting—Sonora Room
3:00 PM–4:00 PM	NBTS Strategic Planning Committee Meeting—Sonora Room
4:00 PM–6:30 PM	NBTS Council Meeting—Sonora Room
Sunday, June 23, 2013	
8:30 AM–5:00 PM	NBTS Registration—Grand Ballroom Foyer
8:00 AM–8:30 AM	Continental Breakfast—Salon A
8:30 AM–8:45 AM	President's Welcome—Salon A
8:45 AM–12:00 PM	Session 1: BTS Symposium—Salon A Environmental Agents and Aging Chair: Chris Newland, <i>Auburn University, Auburn, AL</i>
8:45 AM–9:15 AM	NBTS 01: Dietary Estrogens and Working Memory in Perimenopausal Rodent Models <u>Steven Neese</u> and Susan Schantz, <i>University of Illinois, Champaign-Urbana, IL</i>
9:15 AM–9:45 AM	NBTS 02: Sexually Dimorphic Neurological and Neurocognitive Effects of PCBs and Lead in Aging Workers <u>Richard Seegal</u> ^{1,2} , Edward Fitzgerald ² , Patrick Parsons ^{1,2} , ¹ Wadsworth Center, <i>New York State Department of Health, Albany, NY</i> and ² University of Albany, <i>Rensselaer, NY</i>
9:45 AM–10:15 AM	NBTS03: Aging and Methylmercury Exposure <u>Chris Newland</u> , <i>Auburn University, Auburn, AL</i>
10:15 AM–10:45 AM	Break
10:45 AM–11:15 AM	NBTS 04: The Complexities of the Behavioral Toxicity of Lead (Pb) Exposure during Aging: Importance of Stage of the Life Cycle and of the Dynamics of Pb-induced Changes in Interval Based Schedules of Reward and in Underlying Dopaminergic and Glutamatergic Functions <u>Deborah Cory-Slechta</u> , <i>University of Rochester, Rochester, NY</i>
11:15 AM–11:45 AM	NBTS 05: Aging and Neurobehavioral Effects of Environmental Lead Exposure <u>Marc Weisskopf</u> , <i>Harvard School of Public Health, Boston, MA</i>
11:45 AM–1:00 PM	Lunch on your own
2:00 PM–3:00 PM	Session 1: Elsevier Distinguished Lecturer—Salon A NBTS 06: Placenta Serotonin, Developmental Programming and the Fetal Brain <u>Pat Levitt</u> , A. Bonin, <i>University of Southern California, Los Angeles, CA</i>
3:00 PM–6:30 PM	Session 2: NBTS/TS Joint Symposium Prenatal Origins of Neuropsychiatric Disorders—Salon A Chair: Charles Vorhees, <i>Cincinnati Children's Research Foundation, Cincinnati, OH</i>
3:00 PM–3:45 PM	NBTS 07: Prenatal Infection in Schizophrenia and Other Neuropsychiatric Disorders <u>Alan S. Brown</u> , <i>New York State Psychiatric Institute and Columbia University, New York, NY</i>
3:45 PM–4:30 PM	NBTS 08: Using Animal Models to Study Effects of Prenatal Infection on Brain Development and Behavior Relevant to Psychiatric Disorders <u>Patricia Boksa</u> , M. Burt, Y.C. Tse, T.P. Wong, L. Harvey, <i>McGill University, Dept. of Psychiatry and Douglas Mental Health University, Montreal, Canada</i>
4:30 PM–5:00 PM	Break
5:00 PM–5:45 PM	NBTS 09: Prenatal Human Influenza Viral Infection and Brain Disorder in Mouse: Relevance for Genesis of Schizophrenia S. Hossein Fatemi ¹ , T.D. Folsom ¹ , T.J. Reutiman ¹ , S. Mori ² , R.J. Rooney ⁵ , C. Winter ⁶ , D.F. Smee ³ , T.E. Kornfield ¹ , P. Patterson ⁴ , ¹ Dept. of Psychiatry, <i>University of Minnesota, Twin Cities, MN</i> , ² Johns Hopkins University, <i>Baltimore, MD</i> , ³ Utah State University, <i>Logan, UT</i> , ⁴ California Institute of Technology, <i>Pasadena, CA</i> , ⁵ Genome Explorations, <i>Memphis, TN</i> , ⁶ Dresden University of Technology, <i>Dresden, Germany</i>

- 5:45 PM–6:30 PM NBTS 10: Imaging Early Childhood Brain Development: Implications for Schizophrenia
John H. Gilmore, Dept. of Psychiatry, University of North Carolina, Chapel Hill, NC
- 6:30 PM–8:30 PM TS/NBTS Welcome Reception, Kiva Ballroom
- Monday, June 24, 2013**
- 8:00 AM–5:00 PM **NBTS Registration**—Grand Ballroom Foyer
- 8:00 AM–9:00 AM **Continental Breakfast**—Salon A
- 9:00 AM–12:30 PM **Session 3: NBTS Symposium**—Salon A
Neurobehavioral Consequences of Stress: Prenatal Development Through Adulthood
Chairs: Jerrold Meyer, University of Massachusetts, Amherst, MA, and Sonya Sobrian, Howard University, Washington, D.C.
- 9:00 AM–9:45 AM NBTS 11: The Effect of Prenatal Stress on Behavior and Cortical Organization is Dose-Dependent, Sex-Dependent, and Lifelong
Robbin Gibb, Richelle Mychasiuk, Allonna Harker, Celeste Halliwell, University of Lethbridge, Lethbridge, Alberta, Canada
- 9:45 AM–10:30 AM NBTS 12: Enduring Consequences of Stress on Depressive Behavior During Adolescence
Susan Andersen^{1,2}, Nadja Freund^{1,2}, Heather Brenhouse³, Britta Thompson¹,
¹McLean Hospital, Belmont, MA, ²Harvard Medical School, Belmont, MA, ³Northeastern University, Boston, MA
- 10:30 AM–11:00 AM Break
- 11:00 AM–11:45 AM NBTS 13: Neurobiological Effects of the Interactions Between Stress and Substituted Amphetamines
Bryan Yamamoto, University of Toledo College of Medicine, Toledo, OH
- 11:45 AM–12:30 PM NBTS 14: Influence of Stress on Drug-seeking Behavior and Addiction
Jerrold Meyer, University of Massachusetts, Amherst, MA
- 12:30 PM–1:30 PM **Lunch on your own**
(NTT Editorial Board Luncheon—board members only), Sonora Room
- 1:30 PM–6:00 PM **Session 4: Joint NBTS/TS Symposium**—Salon A
In Memoriam for Patricia Rodier
Chairs: Chris Stogell¹ and Charles Vorhees², ¹Rochester University, Rochester, NY and ²Cincinnati Children's Research Foundation, Cincinnati, OH
- 1:30 PM–1:45 PM NBTS 15: Personal Memories of Pat Rodier
Richard E. Butcher, San Diego Instruments, San Diego, CA
- 1:45 PM–2:30 PM NBTS 16: Manganese Neurotoxicity: From Worms to Neonates
Michael Aschner, J.L. Aschner, N.L. Maitre, Vanderbilt University, Nashville, TN
- 2:30 PM–3:15 PM NBTS 17: Cross-Species Comparisons of the Effects of Developmental Methylmercury Exposure: An Update of a Collaborative Project with Dr. Patty Rodier
Thomas Burbacher, University of Washington, Seattle, WA
- 3:15 PM–4:00 PM NBTS 18: Teratology of Autism: From Animal Models to Endophenotypes
Christopher J. Stodgell¹, L. Bennetto², S.L. Hyman³, ¹OB/GYN, ²Clinical and Social Sciences in Psychology, ³Pediatrics, University of Rochester, Rochester, NY
- 4:00 PM–4:30 PM Break
- 4:30 PM–5:15 PM NBTS 19: Thalidomide, Möbius Syndrome and Misoprostol: Pieces of the Autism Puzzle
Marilyn T. Miller¹, Liana Ventura², Kerstin Stomland³, ¹University of Illinois, Chicago, IL, ²Altino Ventura Foundation, Recife, Brazil, ³Institute of Neuroscience and Physiology, Gothenburg University, Gothenburg, Sweden

5:15 PM–6:00 PM

NBTS 20: Syndromes and the Study of Autism

Tara L. Wenger^{1,3}, C. Kao², M.A. Deardorff¹, D. McDonald-McGinn¹, E.H. Zackai¹, B.S. Emanuel¹, R.T. Schultz³, H. Hakonarson², ¹Division of Genetics, ²Center for Applied Genomics, ³Center for Autism Research, Children's Hospital of Philadelphia, Philadelphia, PA

6:00 PM–8:00 PM

NBTS/TS/OTIS Joint Poster Session, Kiva Ballroom

NBTS P01: Longitudinal Outcomes of MDMA (Ecstasy)-exposed Infants in the United Kingdom

Lynn T. Singer¹, Derek G. Moore², Meeyoung O. Min¹, Julia Goodwin², John J.D. Turner², Sarah Fulton¹, Andrew C. Parrott³, ¹Case Western Reserve University, Cleveland, Ohio, USA, ²University of East London, London, UK, ³Swansea University, Wales, UK

NBTS P02: Binge Drinking Prior to Pregnancy Detection in a Nonhuman Primate: Behavioral Evaluation of Offspring
Mari Golub, Casey Hogrefe, Catherine Vandevoot, University of California Davis, Davis, CA, USA

NBTS P03: Juvenile Pharmacokinetics of Fluoxetine in Rhesus Monkeys

Mari Golub, Casey Hogrefe, University of California, Davis, Davis, CA, USA

NBTS P04: **Conference Award Recipient:** Prenatal Exposure Effects of Repeated Oral Dose of Domoic Acid (DA) on Neurobehavior in Mice

Ju Young Park¹, Motohiro Shiotani¹, Toby Cole¹, Sungwoo Hong¹, William Griffith¹, Thomas Burbacher¹, Lucio Costa^{1,2}, Elaine Faustman¹, ¹University of Washington, Seattle, WA, USA, ²University of Parma Medical School, Parma, Italy

NBTS P05: **Conference Award Recipient:** Trans-generational Behavioral Effects of Neonatal Hypoxia–Ischemia in Rat Progeny

Smitha Infante^{1,2}, Harriett Rea², Regino Perez-Polo², ¹Northern Kentucky University, Highland Heights, KY, USA, ²University of Texas Medical Branch, Galveston, TX, USA

NBTS P06: Social Interaction of Juvenile Rhesus Monkeys During Long-term Treatment with the SSRI Agent Fluoxetine

Mari Golub, Casey Hogrefe, University of California Davis, Davis, CA, USA

NBTS P07: **Conference Award Recipient:** Developmental Methylphenidate Treatment Does Not Alter Novel Object Recognition in Male and Female Rats

Kaitlyn L. Maier, C. Delbert Law, Sherry A. Ferguson, Division of Neurotoxicology, National Center for Toxicological Research, FDA, Jefferson, AR, USA

NBTS P08: Behavioral Effects of Short-term Exposure to Firemaster 550

Jordan Bailey, Anthony Oliveri, Heather Stapleton, Edward Levin, Duke University, Durham, NC, USA

NBTS P09: Zebrafish Embryos Exposed Briefly to Ethanol Show Long-term Behavioral Dysfunction

Anthony Oliveri¹, Jordan Bailey¹, Chengjin Zhang², Jared Frazier², Gregory Cole², Edward Levin¹, ¹Duke University Medical Center, Durham, NC, USA, ²North Carolina Central University, Durham, NC, USA

NBTS P10

Adolescent PCB Exposure Affects Cognitive Set-Shifting in Adult Male But Not Female Rats

Supida Monaikul¹, Paul Eubig¹, Stan Floresco², Susan Schantz¹, ¹University of Illinois, Urbana-Champaign, IL, USA, ²University of British Columbia, Vancouver, B.C., Canada

NBTS P11

Differential effects of dopaminergic ligands microinjected into the medial prefrontal cortex on inhibitory control performance in rats perinatally exposed to PCBs

Abby Meyer, Mellessa Miller, Jenna Nelms, Megan Benson, Lauren Levine, Helen Sable, University of Memphis, Memphis, TN

NBTS P12

Developmental exposure to BPA does not affect the function of outer hair cells in the cochlea of rats

Suren Bandara, Susan Schantz, University of Illinois at Urbana Champaign, Urbana, IL

NBTS P13

Cyp1a1_Cyp1a2(−/−) double knockout mice exhibit impaired motor function

Christine Curran, Anna Lang, Helen Garber, Kelsey Taylor, Melinda Stegman, Breann Hays, Smitha Infante, Northern Kentucky University, Highland Heights, KY

NBTS P14

Developmental methylphenidate (MPH) treatment in rats: Few effects on spatial memory (SM) in the Morris water (MWM) and Barnes mazes (BM).

John Panos, C. Delbert Law, Sherry Ferguson, *National Center for Toxicological Research (NCTR), FDA, Jefferson, AR*

NBTS P15

Development of Hyperactivity and Anxiety Responses in Dopamine Transporter-Deficient Mice

Alex Carpenter, Tommy Saborido, Gregg Stanwood, *Vanderbilt University, Nashville, TN*

NBTS P16

Behavioral Evaluation and Characterization of Neonatal/Juvenile Rats Administered CNS Active Compounds
Jonathan Toot, Mark Herberth, Tim Pringle, Matt Bennett, Sara Loris, Melissa Beck, *WIL Research Laboratories, Ashland, OH*

NBTS P17

A Structural Abnormality Associated with Graded Levels of Thyroid Hormone Insufficiency: Dose-Dependent Increases in Heterotopia Volume

Mary E. Gilbert, A. Johnstone, *U.S. Environmental Protection Agency, RTP, NC, USA*

NBTS P18

Effects of prenatal cocaine exposure on young adult development: Preliminary findings

Gale A. Richardson¹, Lidush Goldschmidt², Nancy L. Day¹, ¹*University of Pittsburgh School of Medicine, Pittsburgh, PA, USA*, ²*University of Pittsburgh Medical Center, Pittsburgh, PA, USA*

8:00 PM–10:00 PM

TS/MARTA Student Career Event—Upper Terrace

Tuesday, June 25, 2013

8:00 AM–5:00 PM

NBTS Registration—Grand Ballroom Foyer

8:00 AM–8:30 AM

Continental Breakfast—Salon A

8:30 AM–12:20 PM

Session 5: NBTS Platform Presentations—Salon A

Chair: Sherry Ferguson, *National Center for Toxicological Research, Jefferson, AR*

8:30 AM–8:50 AM

2013 Richard E. Butcher New Investigator Award

NBTS 21: Adult Neuropsychological Performance Following Prenatal and Early Postnatal Exposure to Tetrachloroethylene (PCE)-contaminated Drinking Water

Patricia Janulewicz, Roberta White, Brett Martin, Michael Winter, Janice Weinberg, Veronica Vieira, Ann Aschengau, *Boston University, Boston, MA*

8:50 AM–9:10AM

NBTS 22: Identifying Effects in Brain of Early Chronic Exposure to Low-level Lead: A Translational Approach
Christina Sobin^{1,2}, ¹*University of Texas, El Paso, TX*, ²*The Rockefeller University, New York, NY*

9:10 AM–9:30 AM

NBTS 23: Prenatal/Early Postnatal History Affects Cannabinoid Receptors in Adolescent Rats

Diana Dow-Edwards¹, Ashley Frank², Dean Wade², Sari Izenwasser², ¹*SUNY Downstate Medical School, Brooklyn, NY*, ²*University of Miami Miller School of Medicine, Miami, FL*

9:30 AM–9:50 AM

NBTS 24: Developmental Methylphenidate (MPH) Treatment has Sex- and Age-specific Effects on Locomotor Activity of Sprague–Dawley Rats

Sherry Ferguson, C. Delbert Law, *Div. of Neurotoxicology, National Center for Toxicological Research, Food and Drug Administration, Jefferson, AR*

9:50 AM–10:20 AM

Break

10:20 AM–10:40 AM

NBTS 25: **Conference Award Recipient:** Prenatal Marijuana Exposure Predicts Marijuana Use in Offspring during Young Adulthood

Kristen Sonon¹, Nancy L. Day^{1,2}, Gale A. Richardson^{1,2}, ¹*Department of Epidemiology, Graduate School of Public Health, University of Pittsburgh, Pittsburgh, PA, USA*, ²*Department of Psychiatry, School of Medicine, University of Pittsburgh, Pittsburgh, PA*

10:40 AM–11:00 AM

NBTS 26: Early Life and Lifelong Oral Manganese Exposure Impairs Visual Attention but not Impulse Control in Adult Rats

Stephane Beaudin¹, Myra Strawderman², Barbara Strupp², Don Smith¹, ¹*University of California, Santa Cruz, Santa Cruz, USA*, ²*Cornell University, Ithaca, NY*

11:00 AM–11:20 AM	NBTS 27: Neurobehavioral Evaluations of Rats Gestationally Exposed to Gasoline Vapors <u>Virginia Moser</u> , Katherine McDaniel, Tracey Beasley, Philip Bushnell, <i>Toxicology Assessment Division, NHEERL, U.S. Environmental Protection Agency, Research Triangle Park, NC</i>
11:20 AM–12:30 PM	NBTS Business Meeting—Salon A
12:30 PM–2:00 PM	Lunch on your own
<u>2:00 PM–5:30 PM</u>	Session 6: NBTS/TS Coordinated Symposium—Salon A Neuroimaging of the Developing Brain Chairs: Susan Makris, <i>U.S. Environmental Protection Agency, Washington, D.C.</i> and Charles Vorhees, <i>Cincinnati Children's Research Foundation, Cincinnati, OH</i>
2:00 PM–3:00 PM	NBTS 28: Neuroimaging of normal brain development from birth to adulthood & neuroplasticity associated with neurological disorder and brain injury <u>Scott K. Holland</u> , <i>Cincinnati Children's Research Foundation and University of Cincinnati, Cincinnati, OH</i>
3:00 PM–3:30 PM	NBTS 29: Neuroimaging in Children Prenatally Exposed to Drugs of Abuse: Considerations for Experimental Design and Statistical Analysis <u>Jennifer Willford</u> ¹ , <u>Dil Singhabahu</u> ² , <u>Nilu Ranaweera</u> ² , <u>Gale Richardson</u> ² , ¹ <i>Slippery Rock University, Slippery Rock, PA</i> , ² <i>University of Pittsburgh, Pittsburgh, PA</i>
3:30 PM–4:00 PM	Break
4:00 PM–4:45 PM	NBTS 30: The Challenges and Rewards of Behavioral Neuroimaging <u>Paul Vaska</u> , <i>Brookhaven National Laboratory and Stony Brook University, Stony Brook, NY</i>
4:45 PM–5:30 PM	NBTS 31: Minimally-invasive Procedures for Monitoring Onset, Time-course, and Intensity of General Anesthetic-induced Developmental Neurotoxicity: Imaging and Behavior <u>Merle G. Paule</u> , <i>National Center for Toxicological Research, Food and Drug Administration, Jefferson, AR</i>
6:00 PM–8:00 PM	NBTS Social
<u>Wednesday, June 26, 2013</u>	
8:00 AM–8:30 AM	Continental Breakfast—Salon A
<u>8:30 AM–12:45 PM</u>	Session 7: NBTS Symposium—Salon A Assessment of Learning, Memory and Attention in Developmental Neurotoxicity Regulatory Studies Chairs: Susan Makris ¹ and Edward Levin ² , ¹ <i>U.S. Environmental Protection Agency</i> and ² <i>Duke University, Durham, NC</i>
8:30 AM–9:15 AM	NBTS 32: Assessment of Attention and Inhibitory Control in Rodents Studies <u>Lori Driscoll</u> ¹ , <u>Barbara Strupp</u> ² , ¹ <i>Colorado College, Colorado Springs, CO</i> , ² <i>Cornell University, Ithaca, NY</i>
9:15 AM–10:00 AM	NBTS 33: Schedule-Controlled Learning & Memory in a Regulatory Context <u>Philip Bushnell</u> , <i>Office of Research and Development, NHEERL, U.S. Environmental Protection Agency, Research Triangle Park, NC</i>
10:00 AM–10:30 AM	Break
10:30 AM–11:15 AM	NBTS 34: Assessment of Working Memory and Reversal Learning in Regulatory Studies <u>Edward Levin</u> , <i>Duke University Medical Center, Durham, NC</i>
11:15 AM–12:00 PM	NBTS 35: Value of Water Mazes for Assessing Spatial and Egocentric Learning and Memory in Regulatory Studies <u>Charles Vorhees</u> , <i>Cincinnati Children's Research Foundation, Cincinnati, OH</i>
12:00 PM–12:45 PM	Consensus Panel on Recommendations for the Learning & Memory Tests for in Regulatory Studies
12:45 PM	NBTS Adjournment