



# Teratology Society

## Newsletter

**Volume 14, Number 1**  
**Posted 23-Feb-2004**

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### Annual Meeting Highlights

It is time to make your arrangements to attend the Teratology Society Annual Meeting in Vancouver. The Program Committee will soon begin the process of selecting the best abstracts for presentation. Contributed papers will be presented in the Student Plenary Session, three platform sessions and two poster sessions.

The meeting will begin with our Education Course, which is entitled "Signaling Pathways and Tissue Interactions in Organ-System Development". Course speakers include Henk Roelink, Claudia Kappen, Vanessa Auld, Barbara Abbott, Rocky Tuan, Ida Smoak, Drucilla Jane Roberts and H. Scott Standler. On Thursday, there will be a Mini Course, "Epidemiology: The Basics". This course

will discuss epidemiology as it pertains to adverse pregnancy outcomes. Separate registration is required for each course.

There is a growing concern about the health effects of obesity within the United States as the number of individuals classified as obese grows at an epidemic rate. To address this concern, the Public Affairs Committee has put together a dynamic symposium focused on maternal obesity. The symposium will cover birth defects and other adverse pregnancy outcomes due to maternal obesity. The symposium will also discuss causes and strategic approaches to preventing obesity.

The Society is excited to have Donald Mattison update us on the National Children's Study. This study is a national study of approximately 100,000 women who will be enrolled as early in pregnancy as possible. The children of these women will be studied into early adulthood. The goal of the study is to answer many of the most pressing questions of childhood development and the effects of early life on adult diseases such as heart disease, cancer, and diabetes.

We are pleased that the Neurobehavioral Teratology Society and the Organization of Teratology Information Services will be meeting with us in Vancouver. We will have a joint session with NBTS on the neurobehavioral outcomes of common prenatal exposures such as to accutane, cocaine, PBC, alcohol, Prozac and Phenobarbital. The joint session with OTIS will be focused on the teratogenic effects of fetal alcohol syndrome, anticonvulsant drugs, pesticides, trimethorim and trichloroethylen. For the first time the Society for Pediatric & Perinatal Epidemiology will join us for a joint session on the epidemiology of miscarriage. The March of Dimes Symposium will focus on RNA Interference (RNAi) approaches to the study of normal and abnormal development. The Wiley-Liss Symposium will be on the role of neural crest cells. The meeting will also feature a Maternal-Fetal Medicine Symposium, "Teratogenic Implication of Maternal Disease and its Treatment", a Computational Systems Biology Symposium, "Computational Systems Biology and Implications for Developmental Toxicology: From Molecules to Systems", and a Pharmacokinetic Symposium, "Pharmacokinetics and Metabolism in Pregnancy and Lactation - Consideration for Maternal Therapy and Fetal and Neonatal Risk". Take a few moments to review the **Annual Meeting agenda** to see all of the opportunities that the 2004 Annual Meeting has to offer.

Vancouver is a multicultural city nestled between the rugged Coastal Mountains and the Pacific Ocean. The city is a rare blend of cosmopolitan amenities, natural splendors and cultural attractions. Most evenings during our meeting will be free so that you can go to one of the outstanding restaurants for dinner. Be sure to save Wednesday evening for the Banquet and don't forget the Welcoming Reception on Sunday. The meeting schedule is designed so that you will also have time for breakfast in a nearby café and lunch at a local deli or bistro.

The Hyatt Regency Vancouver Hotel is just 5 blocks from one end of a 12-mile-long seaside pathway that's suitable for walking, cycling, and in-line skating, and just 2 blocks from Robson Street, an eclectic mix of shops and restaurants. Guests staying at the 34-story Hyatt in downtown Vancouver can splash away in the outdoor swimming pool or work out in the fitness center. The business center, located off the hotel lobby, provides self-serve computers, private office space, and two boardrooms as well as secretarial services upon request.

Make your arrangements now to attend the 2004 Teratology Society Annual Meeting in Vancouver. **Register for the Annual Meeting** no later than May 14th to receive the greatest savings. Don't forget to **make your reservations at the Hyatt Vancouver** no later than May 15th to receive the Teratology Society Meeting rate.

We look forward to seeing you in Vancouver!

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## **MARTA/MTA Student Career Event**

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### **Submitted by Kok-Wah Hew, Ph.D.**

Attention ALL Graduate Students and Postdoctoral Fellows! On Monday, June 28, from 7:30-10:00 PM the Middle Atlantic Reproduction and Teratology Association (MARTA) and Midwest Teratology Association (MTA) will host a Student Career Event for students and postdocs attending the joint annual meetings of the Teratology Society, Neurobehavioral Teratology Society, and the Organization of Teratology Information Services. Please be our guest for dinner, conversation and contacts as you prepare for the next phase in your professional career. This will be a fun opportunity to meet your fellow students/postdocs and to interact with scientists representing all facets of the Societies as you discuss your future and the various career paths available to you. This event has been overwhelmingly well received in the past and we hope to see you there. MARTA and MTA would like to acknowledge the generous financial support provided in the past by Aventis, Covance, Merck, Pfizer, Pharmacia, and the Stephen B. Harris Group making these events possible.

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## **Site Selection – Vice President-Elect Report**

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### **Submitted by Melissa Tassinari**

The site selection for the 2005 meeting has been confirmed. We will be meeting June 25 – 30, 2005 at the Tradewinds Resort in St. Pete's Beach Florida. Complete information on the meeting venue will be available at our 2004 meeting in Vancouver. BC. Site selections for future Annual Meetings is underway. Currently we are exploring locations for 2006 - 2008. Under consideration are Monterey, California; San Francisco, California, Denver, Colorado, Austin Texas; and Tucson Arizona. We welcome any suggestion that you might have for sites to consider, for the 2006 meeting and into the future.

Council continues to try to identify ways to energize the Annual Meeting in order to build attendance and broaden recognition of the Society and the scientific contributions made by our members. The program this year is exciting and touches on all aspects of the research conducted by our Society members. Please send in your abstracts and send along information of our meeting to colleagues who would be interested in this year's program. Your help is needed to urge interested colleagues to attend.

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## Treasurer's Report

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### Submitted by John Rogers, Ph.D.

This will be just a brief update on the budget and financial position of the Society. Although I do not yet have year-end financial statements, it appears that we are on track to exceed our 2003 projection. We approved a deficit budget for 2003, but from the November 30 financial statement it appears that, with investment income received from Legg Mason, we should break even or be in the black by a small amount even before the \$50,000 royalty payment from the publisher. While many of the efforts we have made to improve our finances are really paying off, dues income continued to decline this year. The ramifications of this are far more than financial, and we must all do our best to retain and recruit members to our Society. We must seize every opportunity to do so and not just wring our hands about it at the annual meeting. I know we are all sorely aware of this situation.

For FY2004, Council again approved a budget that projects a deficit - approximately \$14,000. This in part reflects the conservative approach to projecting our revenues and expenses, as we usually come in under budget. It also reflects the realization that we have largely met our financial goal in terms of the size of our reserve, allowing us to invest more in the future of our Society. For example, Council has approved \$10,000 to convene a 1.5 day workshop on Genomics, Proteomics and Bioinformatics in teratology to bring together 10-15 scientists to plan how the Society can foster growth and coordination in this emerging area of research. The Workshop will be planned by the Ad Hoc Genomics, Proteomics and Bioinformatics Committee, Chaired by Tom Knudsen and Vice-Chaired by George Daston. Our ability to support such initiatives will enhance the science and increase the visibility of the Society.

Lastly, I will be leaving the Treasurer's post this year, so I want to thank you all for your support and encouragement during my two terms as Treasurer. I would especially like to express my indebtedness to Tonia Masson and everyone at the business office for their excellent support and service in helping me handle the Society's finances. I have learned much about our Society serving as Treasurer, and I will of course continue to support the Society in any way I can in the future.

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## ***Birth Defects Research Part A: Clinical and Molecular Teratology (BDRA)*** [top](#)

### Submitted by Philip E. Mirkes, Ph.D.

BDRA is now officially in its second year. We have been extremely pleased with both the quality of manuscripts that have been submitted to the journal and the performance of our dedicated reviewers. Our submitting authors appear to be pleased with the peer-review process and the timeliness of publication. The "Early View" (e-publication ahead of print) feature has been well received and is clearly the expected modus operandi for today's scientific journals. We have been working with Wiley and PubMed to expedite the posting of both abstracts and

complete articles and have already seen an improvement.

We wish to thank our colleagues who have submitted their manuscripts to BDRA and encourage them to continue to do so. If you have not yet submitted to BDRA, please consider doing so.

A hearty thanks to our incredible Associate Editors, for their tireless efforts to support and promote the Journal; they are indispensable.

We encourage you to submit your manuscripts to the Society's journals and contribute to a successful second year for Birth Defects Research!

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## **2004 Clarke Fraser Award**

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### **Submitted by Jeffrey M. Peters, Ph.D.**

The Clarke Fraser Award committee is happy to announce the 2004 recipient, Dr. Karen Augustine. Dr. Augustine conducted her graduate work under the guidance of Dr. Tom Sadler at the University of North Carolina, and during this time received the Wilson Award for excellence in pre-doctoral research in the study of birth defects. Dr. Augustine is currently working as Associate Director for the Department of Reproductive Toxicology at Bristol-Meyers Squibb Pharmaceutical Research Institute, and has actively contributed to the Teratology Society since becoming a student member. Please plan to come to the banquet on Wednesday evening, June 30, 2004, at the Annual Meeting in Vancouver to help congratulate Dr. Augustine as she receives this prestigious award.

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## **Constitution & By-Laws Committee**

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### **Submitted by Bruce Beyer, Ph.D., DABT**

Extensive revisions were made to the Constitution & By-Laws two years ago. Now that everyone has had a year to absorb the changes in our Journal and Society, please review the [Constitution and By-Laws](#) and submit any proposed changes to a [Committee member](#) (see Web Site for contacts) or any member of [Council](#). We look forward to hearing from you soon.

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## **Student Affairs Committee**

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### **Submitted by Bruce A. Buehler, M.D.**

The Teratology Society's 44th Annual Meeting is fast approaching and the Student Affairs Committee is looking forward to the opportunities that this meeting

provides. The Program Committee has put together an exciting meeting that not only provides dynamic educational sessions but also a unique networking forum.

On behalf of the Student Affairs Committee, I encourage all students and postdoctoral fellows to attend the Annual Meeting and take advantage of meeting possible collaborators. Don't be shy and don't just stick with other students, introduce yourself to new people, this is a primary reason for the meeting. The Regular and Associate Members of Teratology Society began their careers as you did and have benefited from the contacts that they have made at these gatherings. The Student Affairs Committee and I look forward to meeting all of you, and would be more than glad to introduce you to anyone and to help in identifying possible collaborators.

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## **Member News – Godfrey P. Oakley Jr., M.D. is elected to the Institute of Medicine** [top](#)

**Emory Health Sciences Press Release** (<http://www.emory.edu/WHSC/HSNEWS/releases/oct03/oakley.html>)

Godfrey P. Oakley, Jr., MD, visiting professor of epidemiology at the Rollins School of Public Health at Emory University, has been elected to the Institute of Medicine (IOM) of the National Academy of Sciences. Election to the IOM is one of the highest honors possible in medicine and health, with only 1,382 members nationwide. This year's group of 65 new members was chosen through a highly selective process that recognizes those who have made major contributions to the advancement of the medical sciences, health care and public health.

Dr. Oakley has been called "the folic acid ambassador" for his work to prevent birth defects resulting from folic acid deficiencies, including paralyzing spina bifida and fatal anencephaly. Former director of the Centers for Disease Control and Prevention's Division of Birth Defects and Developmental Disabilities, Dr. Oakley was an advocate to have synthetic folic acid added to all grain products. This position was supported by the Food and Drug Administration in 1996, marking the first change in the federal Food Additive Law since 1943.

Dr. Oakley received his MD from Bowman Gray School of Medicine in 1965 and a MSPM from the University of Washington in 1972. He was named Man of the Week on ABC News in 1996, and won New Zealand's Extra Mile Award in 2001. Also in 2001, the Governor of Oklahoma declared September 13 and 14 Godfrey Oakley Days. In 2003 the EP Maxwell J. Schleifer Distinguished Service Award was presented to Dr. Oakley on Disability Awareness Night at an Atlanta Braves Game in recognition of his lifelong advocacy for the role of folic acid in reducing the incidence of neural tube defects.

"Dr. Oakley is a shining example of a scientist who has translated the knowledge gained through his research into practical applications that have had a tremendous impact on the lives of his fellow human beings," said James Curran, MD, MPH, dean of the Rollins School of Public Health. "We are proud to have Dr. Oakley as a member of our faculty and to share in the legacy he has created as a tireless advocate for the health of children worldwide."

The Institute of Medicine was established in 1970 by the National Academy of Sciences, and has become recognized as a national resource for independent, scientifically informed analysis and recommendations on issues related to human health. Members of the IOM devote a significant amount of volunteer time as members on IOM committees, which engage in a broad range of studies on health policy issues.

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## **American College of Toxicology**

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### **Submitted by George Dearlove, Ph.D., DABT**

The American College of Toxicology held its 24th Annual Meeting in November and the program had something for everyone.

The meeting began with a number of continuing education courses. Then, Dr. Francis Collins, Director of the National Human Genome Research Institute presented the opening plenary lecture in a program geared to discuss the implications of genomic research. Dr. Collins described the government sponsored efforts to uncover the sequence of the human genome and then laid out plans for further developments based on our knowledge of the sequence.

Dr. George Lambert, Professor of Pediatrics at the Robert Wood Johnson Medical School of the University of Medicine and Dentistry of New Jersey presented a keynote lecture in which he discussed the potential linkage between autism and exposure to environmental chemicals. This discussion would have been of interest to the Teratology Society members who attended our last Annual Meeting when autism was the subject of the Warkany Lecture presented by Dr. Rodier.

Dr. Lone Simonsen of the National Institute of Allergy and Infectious Diseases presented an up-to-the-minute lecture on the emergence of SARS as a disease with global pandemic potential. This presentation was scheduled as the "topic of general interest to the attendees" lecture - a recent innovation to the ACT meetings. The intent of these general interest lectures is to bring scientists who are working on current research topics with global implications to the meeting attendees. Previous lectures have covered Bioterrorism and the potential impact of the World Trade Center debris on the rescue workers.

This year's meeting also had a very active and entertaining "great debate" organized by Dr. Shayne Gad. This year the debate addressed the question: "Do the benefits of statins as currently used outweigh the risks?" There were two presenters who argued for and two presenters who argued against the current usage paradigms. The question and answer period following the presentations was lively and prolonged.

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## National Children's Study

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The National Children's Study is a national longitudinal cohort study of environmental effects on child health and development proposed by the President's Task Force on Environmental Health Risks and Safety Risks to Children. Approximately 100,000 women will be enrolled as early in pregnancy as possible, and their children will be studied into early adulthood and possibly beyond. Only a study of this size, scope and design can answer many of the most pressing questions of child development and the effect of early life on adult diseases like heart disease, cancer, and diabetes.

This study will greatly advance knowledge of what is helpful, harmful, and harmless to children and will provide guidance for child health care and policy for decades to come. The Teratology Society will keep this page up to date with new information and updates about the study as they become available.

Several Teratology Society Members are currently serving on National Children's Study Committees. You can become involved by joining the Study Assembly, the primary body for providing feedback during the planning phase. The dynamic dialogue between the Study Assembly and the agencies involved in the study and their partners allows the National Children's Study to adapt so that it can address changing needs and processes. As the planning and pilot phases end and the implementation phase begins, members of the Study Assembly will have a continuing role in helping to shape the Study. More information on the National Children's Study is available on the Teratology Society Web site at [http://teratology.org/news\\_resources/ncs.htm](http://teratology.org/news_resources/ncs.htm).

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## Organization of Teratology Information Services (OTIS)

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### Submitted by Janine E. Polifka, Ph.D.

In November 2003, OTIS had elections for officers of the Executive Council. Donita Vogt was newly elected to the office of Member-At-Large and Carrie Chou was re-elected as Secretary. Tina Chambers took over as President in January 2004. Janine Polifka will remain on the Executive Council for another two years as Past-President.

OTIS is currently conducting a study (The North American Isotretinoin Information and Survey Line) to investigate why women continue to become pregnant even after the manufacturer has implemented a pregnancy prevention program (PPP). The project is funded through a cooperative agreement between the AAMC/CDC/ATSDR. Eight US and 12 Canadian women have been enrolled in the study so far. The goal is to survey 30 women with exposure to isotretinoin to understand how they perceived the PPP. The coordinating center for this OTIS project is the Utah Teratology and Birth Defects Network. Anyone interested in participating in this survey can call Julia Robertson at the coordinating center at 1-800-687-7597 or the OTIS national number 1-866-626-6847.

OTIS has recently established The Humira (adalimumab) Pregnancy Exposure

Registry (Registry), which is a US based registry designed to monitor planned or unplanned pregnancies exposed to adalimumab when used to treat rheumatoid arthritis although pregnant women who have been exposed to adalimumab in association with treatment for any other disease will also be followed. The primary objective of the Registry is to detect any potential increase in the risk of birth defects, specifically a pattern of anomalies, in exposed pregnancies. Secondary objectives are to evaluate the potential effect of exposure on other adverse pregnancy outcomes including reduced birth size and preterm delivery. The primary goal of this registry is to conduct an observational, controlled cohort study which will involve follow-up of live born infants to one year of age. The Humira (adalimumab) Pregnancy Exposure Registry is sponsored by Abbott Laboratories and conducted by the OTIS Research Group as an integrated project within the existing OTIS Rheumatoid Arthritis in Pregnancy Project that is currently sponsored by Aventis Pharmaceuticals. The Rheumatoid Arthritis in Pregnancy Project was established by OTIS in 1998 and continues to be administered by investigators at the coordinating site located at the University of California, San Diego. The contact number for these studies is (877) 311-8972.

Enrollment for The Asthma Medications in Pregnancy Study ended in June 2003. At that time, 1400 women were enrolled and outcome data have been collected on 1102 women. Preliminary results of this study were presented by Robert Felix at the Teratology Society Meeting in June.

This year OTIS held its Mid-Year Research Committee Meeting jointly with the National Birth Defects Prevention Network (NBDPN) in Salt Lake City, Utah between January 20th and 23rd. Meeting jointly with the NBDPN gave OTIS members an opportunity to network with NBDPN and other organizations, such as March of Dimes, The Association of Maternal and Child Health Programs, and CDC's Environmental Health Tracking, that share a similar mission. OTIS has added five more pediatricians to conduct dysmorphology exams for its studies: Drs. Karen Grippe, Carole Clercuzio, Luanne Hudgins, David Stevenson, and Keith Vaux. Part of the Research meeting was spent in training these newly-added pediatricians in the OTIS dysmorphology exam protocol and to evaluate reliability between examiners. Four sets of parents kindly volunteered to have their infants examined by each of the pediatricians.

The 17th International Conference of OTIS will be held in conjunction with the Teratology Society between June 25-28, 2004 in Vancouver, B.C., Canada. Dr. James Hanson, Acting Director, Center for Developmental Biology & Perinatal Medicine, National Institute of Child Health & Human Development, has been invited to give the Thomas H. Shepard Lecture. Dr. Sonja Rasmussen, who is with the NCBDDD, will be giving a talk on maternal obesity and pregnancy; Dr. Elaine Faustman has been asked to give a talk on pharmacogenomics and teratology; and Dr. Robert Brent will be talking about the difficulties in interpreting spontaneous abortion rates. OTIS will also have a session on breastfeeding issues and Dr. Thomas Hale, author of the well-known book, Medications and Mother's Milk, has agreed to give a talk on this topic. Molly Pessl, a lactation consultant at the University of Washington, will be speaking on the practicality of advice such as "pumping-and-dumping" and breastfeeding problems in premature infants. Back by popular demand, the FDA/CDER will put together another panel session similar to what was done at last year's meeting with the pregnancy labeling issue. This time, however, the panel will discuss drug use during lactation and what the FDA is doing with respect to this. Gerald Briggs, author of the widely-used and authoritative book, Drugs in Pregnancy and

Lactation, has agreed to moderate the Breastfeeding session. And finally, the joint OTIS/Teratology Society Symposium will feature presentations on hypertension and diabetes.

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## **Reproductive & Developmental Toxicology**

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### **A Specialty Section of the Society of Toxicology Submitted by William Slikker, Jr., Ph.D.**

The 43rd Annual meeting of the Society of Toxicology will be held in Baltimore, Maryland on March 21 – 25, 2004. It is not too late to make plans to attend, for more information please visit the [SOT Web site](#). The following scientific sessions are being sponsored or cosponsored by the Reproductive and Developmental Toxicology Specialty Section:

#### Continuing Education Courses

**AM6 Basic: Understanding Lifespan Changes in Form and Function of the Female Reproductive System to Assess and Interpret Toxicity**

Chairpersons: Barbara J. Davis, NIEHS, Research Triangle Park, NC and Kimberley A. Treinen, Schering Plough Research Institute, Lafayette, NJ. This course reviews the basic morphology and endocrinology of the female reproductive system in rodents and primates as a basis for interpreting toxicity. Each of the 4 lectures will emphasize fundamental changes and vulnerabilities of the reproductive tract over the lifespan of the female. Both rodent and non-human primates will be discussed with respect to relevance to humans. The first lecture covers embryological development of the female reproductive system and will include key developmental and molecular events with an emphasis on timing of events in rodents and primates and potential periods of susceptibility to toxicity. The second lecture details the morphology and endocrinology of the female reproductive tract in rodents and will relate hormones and histology of the adult rodent reproductive tract from the onset of puberty to reproductive senescence and important sites of toxicity. The third lecture details the morphology and endocrinology of the female reproductive tract in nonhuman primates with emphasis on similarities and differences to rodents. The final lecture will combine the information of the first lectures and analyze issues of study design, endpoints to examine and interpretation of results in assessing female reproductive toxicity data.

Embryological Development of the Female Reproductive System, Philip M. Iannaccone, Northwestern University Feinberg School of Medicine and Children's Memorial Institute for Education and Research, Chicago, IL.

Morphology and Endocrinology of the Female Reproductive Tract in Rodents, Pamela E. Blackshear, Integrated Laboratory Systems, Inc., Research Triangle

Park, NC.

Morphology and Endocrinology of the Female Reproductive Tract in Nonhuman Primates,

J. Mark Cline, Wake Forest University School of Medicine, Winston-Salem, NC.

Interpreting Female Reproductive Toxicity Data, Patrick J. Wier, GlaxoSmithKline, King of Prussia, PA.

Roundtable\*

Contribution of Neurobehavioral Assessment of Offspring to Hazard Identification and Characterization (cosponsored with Neurotoxicology)

Symposia\*

Steroid Inactivation: Alternative Mechanisms of Endocrine Toxicity (cosponsored with Mechanisms and with Molecular Biology)

Mechanisms of Cardiovascular Toxicity by 2,3,7,8-Tetrachlorodibenzo-p-dioxin and Related Halogenated Aromatic Hydrocarbons (cosponsored with Mechanisms)

Systems Biology: a new venue for exploring mechanisms of developmental toxicity

Workshops\*

The National Children's Study: Progress developing methods appropriate for assessing children's exposure, biomarkers, and genetic susceptibility (cosponsored with Neurotoxicology)

Hormone Replacement Therapy: A Challenge of Risks and Benefits (cosponsored with Regulatory and Safety Evaluation, with Risk Assessment, and with Women in Toxicology)

Zebrafish-A Model Organism for Assessing Developmental Toxicity in Drug Discovery/Environmental Risk Assessment (cosponsored with In Vitro, with Neurotoxicology, and with Regulatory and Safety Evaluation)

\*Please note that detailed information about the above-listed events was not available at newsletter publication. For more information about SOT please visit the [SOT Web Site](#).

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## **New Newsletter Column: Musings from the Membership**

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This new feature has been added to encourage the membership to actively contribute to our newsletter. The inaugural article is from one of our Emeritus Members - John Thomas

## Zebrafish – A Model for Developmental Toxicology and Teratology Submitted by John A. Thomas, Ph.D.

The Zebrafish (*Danio rerio*) has become an essential tool to many branches of science including molecular biology, genetics, toxicology and teratology. Although Zebrafish are believed to have derived from humans about 500 million years ago, they are remarkably similar and thus may provide a valuable tool to study human biology and human diseases. A knowledge of the Zebrafish genome will enhance our understanding of basic developmental biology, toxicology, gene transfer and possibly the analysis of the role of specific genes and signaling pathways in development.

The late Dr. George Streising, University of Oregon, developed the Zebrafish model and additional information about this model system may be obtained from 'The Fishnet,' a collection of Zebrafish resources maintained by the Institute of Neurosciences at the University of Oregon. The glossary ZFIN is also available online.

This tiny fish (about 1 to 2 inches in length), native to the Ganges River in India, could very well replace the laboratory mouse as an experimental animal/tool in certain genetic studies. It may also lead to a better understanding of human diseases of the heart, aorta, and brain and has potential for the study of certain cancers, muscular dystrophy, ocular and auditory disorders.

The Zebrafish requires less space, is less expensive than the laboratory mouse (less than one-tenth of the costs to maintain a mouse colony) and reproduces prolifically (spawning about 2,000 progeny/year while the mouse may produce only about 48 offspring/year). The N.I.H. plans to invest nearly \$20 million dollars in a Zebrafish facility that will house as many as a half-million of these cold-blooded invertebrates.

This two inch black-striped Zebrafish is becoming known in scientific circles as the best animal to use when studying genetics – perhaps even better than the mouse. The Zebrafish might even replace the laboratory mouse in some proteomic research. The Zebrafish has already been instrumental in the genetic analysis of spontaneous and induced mutations and has led to the discovery of invaluable clues understanding various complex molecular processes.

Mutations in Zebrafish, generated primarily by N-ethyl-N-nitrosourea (ENU), have resulted in the development of various screening assays and resulted in the Zebrafish being proposed as a model for studying several other disease states and it has recently become a popular model for examining cardiovascular development. Fish have a long history of use in cancer toxicology since they develop neoplasms that are histologically similar to many human tumors.

The Zebrafish is emerging as a model of choice for studying the molecular basis of neurodevelopment with behavioral tests determining the functional capacities of Zebrafish providing an alternate species in neurobehavioral teratology and toxicology. It has also been used to study phenotypes of human alcoholism and is an excellent gerontological model.

The area of drug discovery has an interest in using the Zebrafish because its small size allows for in vivo high-throughput drug screening. The rapid

generation time and high fecundity, coupled with the fish's transparency (the Zebrafish produces optically transparent embryos that develop rapidly outside the mother's body) allows for rapid simultaneous analysis of multiple organ systems and tissues. The application of drugs to Zebrafish is simple because the embryos rapidly absorb low molecular weight compounds and hydrophilic compounds may be injected at the first to the fourth cell stage into the yolk sac or later into the sinus venosus. Fish older than seven days postfertilization to the adult stage can absorb compounds orally from the tank water. A statistically significant sample size can be easily attained with only a small amount of drug required. Thus, Zebrafish pharmacological assays have specific advantages compared to in vitro cell cultures and in vivo rodent tests.

Zebrafish have also been used in certain ecological tests and environmental studies. Genetically modified Zebrafish can readily detect the presence of heavy metals and other toxicants. There are populations of transgenic fish that produce a green fluorescent protein after exposure to environmental stresses. This fluorescent protein can be used to monitor adverse effects due to a wide variety of environmental pollutants. Hence the "glowing" Zebrafish provides a sensitive water testing system for PCBs and other contaminants.

Finally, Zebrafish have greatly enhanced our understanding of the mode of specification of primordial germ cells (PGCs), cell-fate maintenance and the migration of these cells towards their target, namely, the gonads. It has been possible to identify genes as molecular markers expressed in the specific germ cells. The extrauterine development and transparency of this fish model renders it well suited to examine the processes of cell migration and provides a better understanding of the signal(s) that direct the PGCs to the gonads. Insight into the mechanism(s) of developmental toxicity is not well known, but the Zebrafish may provide a novel experimental model in order to better understand congenital anomalies arising from genetic mutations.

#### Recommended Readings

Ackermann, G.E. & Paw, B.H.: Zebrafish: A Genetic Model For Vertebrate Organogenesis And Human Disorders. *Frontiers in Bioscience* 8:1227 – 1253, 2003

Langheinrich, U.. Zebrafish: A New Model On The Pharmaceutical Catwalk. *BioEssays* 25:904 – 912, 2003

Raz, E.: Primordial Germ-Cell Development: The Zebrafish Perspective. *Nature Reviews-Genetics* 4:690 – 700, 2003

Stern, H.M. & Zon, L.I.: Cancer Genetics And Drug Discovery In The Zebrafish. *Nature Reviews-Cancer* 3:1 – 7, 2003

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### **The NIH Director's Pioneer Award Program Announcement**

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The National Institutes of Health (NIH) invites nominations for the NIH Director's

Pioneer Award (NDPA), a key component of the NIH Roadmap for Medical Research.

The goal of the program is to stimulate high-risk, high-impact research by enabling exceptionally creative investigators from multiple disciplines – including biomedical, behavioral, social, physical, chemical and computer science; engineering; and mathematics -- to develop and test groundbreaking ideas relevant to NIH's mission.

In fiscal year 2004, the NDPA program will fund 5-10 awards of up to \$500,000 direct costs per year for 5 years.

The program is not intended to support ongoing research projects or expand the funding of persons already well supported. Investigators at early stages of their careers and those who have not previously applied for NIH support are especially encouraged.

Nominations will be accepted from March 1, 2004 through midnight April 1, 2004, Eastern Standard Time.

For more information or to submit a nomination, visit the [NIH Director's Pioneer Award Web site](#).

Press Release  
[NIH Director's Pioneer Award press release](#).

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## Teratology Society Web Site

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### Submitted by Robert Felix

The Web site Committee has added several new features to the Society's Web site. Many of you have taken advantage of the new **On-Line Dues Payment** (<http://teratology.org/members/dues/dues.htm>). If you have not yet paid your 2004 Annual Membership Dues, please take a moment and do so online.

We are pleased to announce that **on-line registration** ([http://teratology.org/meetings/2004/meeting\\_reg.htm](http://teratology.org/meetings/2004/meeting_reg.htm)) is now open for the 2004 Teratology Society Annual Meeting. Please take advantage of this new service and the advance registration pricing by registering before May 14th.

The **Membership Directory** (<http://teratology.org/members/directory.htm>) is a useful tool for members to locate other members. You now have the option to update your contact information once you log into the directory. Your on-line information is updated immediately and the headquarters office is notified, allowing them to update their records. In addition to updating your contact information, you can also change your password, please note that all new passwords need to be nine characters or less.

The Federal Government sends out announcements of new funding opportunities almost daily. The Web Site Committee thought it would be useful to provide this information on the web site. There is now a list of **grant opportunities** on the Research Funding (<http://teratology.org/members/funding.htm>) page. The information will be updated on a regular basis.

Attention Students - The Teratology Society Website Committee is looking for a "few good students" to help revise and update the "**Just for Students**" (<http://teratology.org/jfs/teratologyindex.html>) page on the Society's Web site. Web design skills are not necessary, as the main focus of the committee is on web page content. This is a great opportunity for active participation in the Teratology Society, as well as a chance to expand your network within the teratology community and to enhance your C.V.

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