

# STC NEWS/NOUVELLES

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BULLETIN OFFICIEL DE LA SOCIÉTÉ DE TOXICOLOGIE DU CANADA  
OFFICIAL NEWSLETTER OF THE SOCIETY OF TOXICOLOGY OF CANADA

C.P./P.O. Box 517, Beaconsfield, Quebec, Canada H9W 5V1 <http://www.stcweb.ca>

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VOLUME XXVII, NUMBER 1  
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.....	Dr. Jamie Nakai

**Editor: Dr. William J. Racz**  
E-mail: [raczw@queensu.ca](mailto:raczw@queensu.ca)  
Tel: (613) 533-6113

## From the Editor's Desk

### Bill Racz

I would like to congratulate all those dedicated members of STC who worked so hard to make ICT-XI a huge success scientifically and socially, and as I understand it, financially as well. The symposia topics represented a wide range of interesting and emerging issues. The science was excellent as was the social programs. The river cruise and dinner was especially noteworthy. The value of this meeting goes well beyond the science we shared with friends from far off lands. The main values of hosting a meeting such as ICT-XI is that it show cased Canadian Toxicology. This event showed the world, if they already did not know, that Canadian Science is strong and well developed.

I trust that the CFBS who lobbies government for more funding for our federal granting agencies will use the ability of a relatively small society such as STC to host a major international meeting to further the rationale for funding of research in Canada. The success of this meeting speaks volumes for the dedication and ability of Canadian scientists, especially toxicologists.

Several issues have peaked my interest in the past few months. The first was the realization that a number of the biological drugs have toxicities that were not detected in the initial testing. The testing of biologicals poses a problem that toxicology has not had to deal with in the past. I will use biologicals against tumor necrosis factor alpha as an example. A number of biological drugs have been developed that either are antibodies against TNF $\alpha$ , TNF $\alpha$  receptor proteins, or TNF $\alpha$  receptor antagonists. These drugs are approved for treatment of malignancies, inflammatory disease such as rheumatoid arthritis, and some of the inflammatory bowel diseases as well as hyper-proliferative/inflammatory disorders such as psoriasis. The drugs have efficacy in all of these disorders. Now for the problem facing toxicology – how do we evaluate the long-term toxicity of these agents? Determining the short-term toxicity of the biological is relatively simple as we can

apply the principles and techniques we use for other “chemical” compounds. What is more difficult to determine is the long-term effect of inhibiting a cytokine such as TNF in all tissues. TNF and other cytokines have multiple functions in many tissues and organs, not only in inflamed and malignant tissue. What is the effect of inhibiting TNF, or any other cytokine for that matter, on a long-term basis? Perhaps the symposium in December will begin to answer this question.

Another issue that peaked my interest is bisphenol A, a component of polycarbonate and epoxy resins. As the President has commented on this issue in her report, I have removed my thoughts on the matter. I will only state that it is interesting to note that a number of regulatory agencies have differing views on the matter.

The other issue I followed over the past six months or so is the use of Tasers to subdue an “unruly” individual by law enforcement agencies. Now I know everyone is saying, Tasers are not a toxic agent, or are they? But that is not the point I want to make. The key issue in the Taser debate is the blind belief in the safety of the device by proponents, that they totally disregard facts that appear to be common sense. It appears to me that if you apply a Taser to someone and that person dies in the next few minutes, as was the case with Robert Dziekanski in late 2007 and other individuals (over 250 Taser-related deaths have been documented by Amnesty International) that there just might be a cause-and-effect relationship. Fortunately, medical experts are now starting to question the safety of this device. Evidently the voltage that is delivered can disrupt the normal rhythm of the heart, especially if the current is applied to the chest. This should not be a surprise; any process that disrupts excitable tissue such as skeletal muscle might be expected to affect other excitable tissue as well. Blind belief in a concept or entity is not restricted to fields that on the surface at least appears to lack scientific rigor, but occurs in all fields of main stream science. I had the good fortune of spending a year in the laboratory of Dr. Manny Farber, and the one thing that Manny taught all his students,

“show me the data”. In other words, we base decisions on scientific evidence, not beliefs; a lesson I try to follow. I do not always succeed, but I keep reminding myself that I should look at the facts.

On a personal note, I took another step into retirement – again. Last June 30, I relinquished the reins of the Life Sciences program at Queen’s. I still do some teaching and continue to serve on a few committees. I was hoping to spend more time canoeing and camping but so far that has not happened. People assume that when you retire you have all this free time and ask you to do all sorts of volunteer work. There is one advantage of getting older; you can give advice more freely, and if your advice is correct, you can attribute it to the wisdom of age, and if you are wrong, well it was a senior’s moment.

## **From the President’s Desk**

### **Genevieve Bondy**

Greetings from Ottawa! This is my first official newsletter posting as President, and thus my first chance to indicate how much I look forward to the next few years. It was gratifying to witness the hard work and dedication that STC members put forth to make the XI<sup>th</sup> International Congress of Toxicology such a successful meeting last July, and I look forward to capitalizing on our momentum as we gear up for our regular Annual Symposium on December 1 and 2, 2008 in Montreal. Our Program Committee, headed by Dr. Lynne LeSauter, is putting together a fantastic symposium on the future of toxicity testing that will provide a forum for collegial discussions on current and future approaches for assessing xenobiotic safety. For an update on the Symposium program, please look ahead in this newsletter or check out the STC website. The meeting will be held at the Delta Centre-Ville on University, near the train station, where we’ve met for a number of years now. Feedback on this location has been good, but if any of you have an opinion on this location or any other that STC might wish to consider for future meetings, please let me know ([genevieve\\_bondy@hc-sc.gc.ca](mailto:genevieve_bondy@hc-sc.gc.ca)).

Any of you who have picked up a newspaper or listened to the evening news lately couldn’t possibly have missed the news of Canada’s decision on bisphenol A. Without reiterating the whole story, the short version from Health Canada’s website is that “Canada is the first country in the world to complete a risk assessment of bisphenol A in consultation with industry and other stakeholders, and to initiate a 60 day public comment period on whether to ban the importation, sale and advertising of polycarbonate baby bottles which contain bisphenol A” ([http://www.hc-sc.gc.ca/ahc-asc/media/nr-p/2008/2008\\_59\\_e.html](http://www.hc-sc.gc.ca/ahc-asc/media/nr-p/2008/2008_59_e.html)). From the standpoint of a toxicologist completely removed from the decision-making on this particular chemical, I have to admit to some excitement when I see media coverage of issues that are profoundly influenced by our profession, both from the regulatory and the research sectors. For me this issue represents a classic example of the interplay between toxicology, risk assessment and policy, and a useful example for our student members who may be making decisions about their careers in toxicology.

As you all know STC is a member of an umbrella society, the Canadian Federation of Biological Societies (CFBS). CFBS has dual roles – to advocate for the ongoing financial support for life sciences in Canada and to highlight Canadian science and science in general via its annual conferences. In recent years the latter have not been a consistent source of income. In May I’ll be participating in a meeting with the CFBS Executive and member society presidents at which we’ll discuss the role of CFBS in advocating for member societies and the future of the CFBS Annual Conference. I’ll be reporting these discussions back to our STC Executive, and we anticipate re-introducing a discussion of our continued membership in CFBS at the Annual General Meeting in Montreal in December. Over the next few months I encourage each of you to think about the value that you place on STC’s membership in CFBS, and to attend the AGM in December and have a voice in the decision-making on this subject. Until then, all the best.

## Awards and Honours

### STC V.E. Henderson Award Recipient Louise Winn

Louise Winn obtained a B.Sc. in Biochemistry from the University of Minnesota and an M.Sc. and Ph.D. in Toxicology from the University of Toronto. This work was under the supervision of Peter Wells in the Faculty of Pharmaceutical Sciences. Upon completion of her doctorate, she spent two years as a postdoctoral fellow at the University of New Mexico in the laboratory of Scott Ness.

In 2001, she returned to Canada and accepted her current position as an Assistant Professor at Queen's University, a joint appointment between the Department of Pharmacology and Toxicology and the School of Environmental studies.

Dr. Winn's research program investigating *in utero* initiated teratogenesis employs a unique combination of expertise in the biochemical and morphological assessment of chemical teratogenicity, coupled with proficiency with cutting-edge molecular toxicological approaches that allows her to address fundamental mechanistic questions. Recognition of the novelty and quality of Dr. Winn's research by the scientific community are reflected by her receipt of: (1) the Rx&D Health Research Foundation Career Award in the Health Sciences, which is a highly competitive five-year salary award; (2) the Premier's Research Excellence Award; (3) the Mihran and Mary Basmajian Award, which is the only award made by the Faculty of Health Sciences at Queen's to recognize excellence in medical research; (4) the research grants and publications that are summarized below; (5) invitations to serve on a grant review panel of the Cancer Research Society and on the editorial board of Toxicology Letters; and (6) ten invitations to give scientific presentations at local, national and international venues.

Louise has made a number of significant contributions to her chosen field of research, some of which include:

1. Her lab was the first to demonstrate a role for the c-Myb transcription factor signaling pathway in chemical teratogenesis.
2. Her group demonstrated a key role for reactive oxygen species in benzene embryotoxicity.
3. They demonstrated the importance of DNA recombination in the action of developmental toxicants.

Louise's hard work and that of her students has resulted in 23 papers, seven book chapters or reviews, and 62 abstracts. All these publications appear in high quality journals.

Louise is a dedicated teacher at both the undergraduate and graduate levels. She is a superb role model for her students. One of her recent students to graduate described her lab as a "fantastic place to work". She has graciously and enthusiastically assumed toxicology teaching responsibilities in the Department of Pharmacology and Toxicology and the School of Environmental studies at Queen's and has excelled. Since arriving at Queen's, Louise has supervised seven Master's and three Doctoral students. Her students have presented papers at national and international meetings and several have been very successful at attracting highly competitive external awards and scholarships. Her students speak very highly of her as a supervisor. The enthusiasm and positive attitude is infectious.

Dr. Winn has been an active member of the STC. She has been a regular attendee at annual symposia since 1994. In 2005, she completed a three-year term on the Program Committee, and chaired that committee in preparation for the very successful 38<sup>th</sup> Annual Symposium entitled "*The Impacts of Toxicants on Child Health*". Dr. Winn also chaired scientific sessions at the 2003 and 2004 STC annual meetings, at the International Dioxin Conference (2005), and at the Annual Meeting of the Teratology Society (2006). Dr. Winn is the sole Canadian on the 38-member editorial board of the journal *Toxicology Letters*, she serves on the Board of directors of Canadians for Health Research, and she is currently Co-Chair of the interdisciplinary Queen's University Environment and Human Health Research Group.

**STC Cantox Student Research Awards  
Presented at ICT-XI, Montreal QC,  
July 2007**

The ICT-XI meeting last summer was an opportunity for STC to showcase the excellence of its student members by presenting our awards at an international conference. Congratulations to Tara Barton (McGill University) and Marc-André Verner (TOXEN, Université du Québec à Montréal), who were, respectively, our Ph.D.- and M.Sc.-level award winners for the STC Cantox Student award. Their abstracts are reproduced below.

**Barton, Tara, Robaire, B., Hales, B.F.**

*Poly (ADP-ribose) polymerase-1: DNA damage detection and repair in rat zygotic pronuclei following chronic paternal cyclophosphamide exposure.* McGill University, Montreal, Canada

Preconceptional paternal cyclophosphamide (CPA) exposure leads to aberrant regulation of dynamic epigenetic processes, dysregulated zygotic gene activation, and abnormalities transmissible to subsequent generations. Poly (ADP-ribose) polymerase-1 (PARP-1) binds with high affinity to DNA strand breaks and subsequently stimulates DNA repair thus playing a critical role in the maintenance of genomic integrity. The goal of our study was to determine the effect of paternal CPA exposure on PARP-1 in the zygote. Sprague-Dawley rats were gavaged with CPA for 4-5 weeks. Males were mated with control females; 1-cell embryos were collected and PARP-1 immunofluorescence was assessed. Optical sections were recorded using confocal laser scanning microscopy and images were analyzed quantitatively. PARP-1 immunofluorescence of both paternal pronuclei was significantly altered, compared to corresponding controls, in zygotes fertilized by CPA exposed spermatozoa; PARP-1 proportional grain areas of male and female pronuclei were significantly elevated at pronuclear stage 3 (PN3) ( $p,0.001$ ) and maintained a hyperactivated state at PN4 ( $p\leq 0.005$ ). Immunofluorescence was differentially distributed in male and female pronuclei in embryos sired by CPA exposed males; a large proportion of zygotes at PN3-5 stages displayed dense PARP-1 staining in perinucleolar regions

compared to controls. These results suggest that preconceptional paternal CPA treatment alters spermatozoal chromatin integrity in a manner that rapidly initiates a DNA repair response in both parental genomes. Inefficient repair of DNA damage may lead to persistent genomic modifications contributing to heritable developmental instabilities. Supported by CIHR.

**Verner, Marc-André, Charbonneau, M.,  
Haddad, S.**

*Persistent organic pollutants in breast cancer epidemiological studies: A physiologically based pharmacokinetic modeling framework for estimating lifetime toxicokinetic profiles.* Département des sciences biologiques, TOXEN, UQAM, and INRS-Institut Armand Frappier, Pointe-Claire, QC.

Persistent organic pollutants (POP) have been shown to promote breast cancer development in both *in vivo* and *in vitro* experimental models. Meta-analyses of epidemiological studies did not support an association between POP exposure and breast cancer incidence in humans. This may be due, in part, to difficulties in relevant exposure assessment and to the lack of tools to adequately estimate blood or tissue POP concentrations at critical time periods of carcinogenesis. This study aimed to build a physiologically-based pharmacokinetic model (PBPK) which could be used as a tool for the estimation of past internal exposure to POPs in breast cancer epidemiological studies. The developed lifetime PBPK model simulates woman body physiological processes (e.g. growth, pregnancy, breastfeeding) and POP kinetics for given exposure scenarios. Using data on height, weight, and age, the model estimates the values of physiological parameters (e.g. organ volume, blood flow and composition) throughout the entire life of a woman. The compound related parameters used as inputs in the model are the log n-octanol:water partition and the half-life that are available from the literature. The model allows the consideration of temporal variations in the daily intake from ingestion. The latter can be based on data obtained from a questionnaire on exposure or on theoretical average scenarios. Several scenarios with different physiological profiles were simulated using the POP hexachlorobiphenyl (HCB),

2,2',3,4,4',5,5'-heptachlorobiphenyl (PCB-180) and 2,2',4,4',5,5'-hexachlorobiphenyl (PCB-153). Simulations showed that women with a same blood concentration at 55 years of age may have completely different lifetime toxicokinetic profiles. Aside from exposure scenarios, factors that were shown to have the greatest impact on the lifetime toxicokinetic profile are the time and duration of lactation periods and weight history. Lactation alone was responsible for a reduction of approximately 19-25% and 31-45% in POP concentration for a 6- and 12-month breastfeeding period starting at age 30, respectively. This PBPK modeling tool will permit researchers conducting environmental epidemiology studies to reduce the uncertainty linked to past POP exposure estimation and to consider exposure time windows that are hypothesized to be mechanistically critical in carcinogenesis. (SH is a recipient of a research scholarship from FRSQ).

### **STC Student Travel Awards (in support of travel to ICT-XI in Montreal)**

Congratulations are also in order for our STC Student Travel Award winners: Helen Badham (Queen's University); Edward Dere (Michigan State University); Katherine Guindon (Queen's University); Ivy Moffat (University of Toronto), Anne Mullen (University of Toronto); Rana Sawaya (University of Toronto).

### **Other Awards and Honours**

STC members have been accumulating awards and honours beyond those offered by our own society. At the Society of Toxicology meeting in Seattle, Washington, this year, Marc-André Verner (UQÀM) was awarded best abstract in the Mixtures Specialty Section for his abstract entitled "*Drug interference with biotransformation of bisphenol A and nonyl-phenol in rats*". Also at SOT, Sarah Ali-Khan and Dr. Barbara Hales (McGill University) were awarded an honourable mention for best paper published in Toxicological Sciences in 2006-7. The abstract is reprinted below. If you know of a worthy recipient who you would like to see mentioned in a future

newsletter, please send any information about the recipient and the award to the STC (stcsecretariat@mcgill.ca).

#### *Novel Retinoid Targets in the Mouse Limb During Organogenesis*

Ali-Khan, S.E. and Hales, B.F. 2006. *Tox. Sci.* 94: 139-152.

Bioactive retinoids are potent limb teratogens, upregulating apoptosis, decreasing chondrogenesis, and producing limb-reduction defects. To target the origins of these effects, we examined gene expression changes in the developing murine limb after 3 h of culture with teratogenic concentrations of vitamin A. Embryonic day 12 CD-1 limbs were cultured in the absence or presence of vitamin A (retinol acetate) at 1.25 and 62.5 $\mu$ M (n = 5). Total RNA was used to probe Atlas 1.2 cDNA arrays. Eighty-one genes were significantly upregulated by retinol exposure; among these were key limb development signaling molecules, extracellular matrix and adhesion proteins, oncogenes, and a large number of transcriptional regulators, including *Eya2*, *Id3*, *Snail*, and *Hes1*. To relate these expression changes to teratogenic outcome, the response of these four genes was assessed after culture with vitamin A and retinoid receptor antagonists that are able to rescue retinoid-induced malformations; expression levels were correlated with limb malformations. Lastly, pathways analysis revealed that a large number of the genes significantly affected by retinoid treatment are functionally linked through direct interactions. Several regulatory gene cascades emerged relevant to morphogenesis, cell-fate, and chondrogenesis; moreover, members of these cascades crosstalk with one other. These results indicate that retinoids act in a coordinated fashion to disrupt development at multiple levels. In sum, this work proposes several unifying mechanisms for retinoid-induced limb malformations, identifies novel retinoid targets, and highlights *Eya2*, *Id3*, *Snail*, and *Hes1* as potential key teratogenic effectors.

## 2008 STC Award of Distinction and STC V.E. Henderson Award

### Notice to all STC members:

We are now accepting nominations for the 2008 STC Award of Distinction and the STC V.E. Henderson Award.

Please return nominations by e-mail to [stcsecretariat@mcgill.ca](mailto:stcsecretariat@mcgill.ca) by July 1, 2008.

### STC Award of Distinction

**Purpose:** The purpose of the STC Award of Distinction is to honour those individuals who have made outstanding and sustained contributions to the science of toxicology in Canada and/or the Society of Toxicology of Canada.

**Nomination Process:** Nominations must be made by two regular members of STC, in good standing, but no member may nominate more than one candidate during any one year. Nominations for the award shall be made to the Chairperson of the Awards Committee by July 1st of the year of the award. Nominations must be accompanied by:

1. A summary, not to exceed two pages, describing the nominee's contribution to the science of toxicology and/or to the STC.
2. Copies of no more than five manuscripts and other documents considered by the sponsor to be pertinent to the award.
3. The nominee's curriculum vitae and a brief biographical sketch suitable for press release.

Nominees who are not granted the award in the year of the nomination will be automatically included among the nominees in the two subsequent years unless the sponsors explicitly request otherwise. Sponsors will be invited to update previously submitted information.

**Selection:** The Awards committee is chaired by Past President and includes the junior councillor plus two members appointed by the Board from the general membership and who are not members of the Board. Nominations for the latter two members will be requested from the floor at the

AGM. In current practice, the Past President as chair of the committee, nominates two members who have familiarity with the candidates work.

**Criteria:** The following criteria will guide the Selection Committee:

1. The recipient should have demonstrated outstanding and sustained contributions to the science of toxicology in Canada, and/or the recipient should have provided outstanding and sustained service to the Society of Toxicology of Canada.
2. The Selection Committee will exercise discretion regarding the relative contribution of the recipient to the science of toxicology in Canada and/or service to the Society of Toxicology of Canada.
3. The decision of the Selection Committee shall be final. Only one award may be made annually, and there is no obligation or duty to make the award when, in the opinion of the Selection Committee, there is no qualified nominee. Once the Selection Committee has completed their deliberations, the Chairperson will notify the Board their decision, and will in turn notify the successful nominee as appropriate.

Applications should be mailed to the STC mailing address by July 1 (or by e-mail to the STC Secretariat).

The Award takes the form of an engraved plaque plus a cheque for \$500. Presentation of the award will be made at the president's reception following the Annual General Meeting. One of the nominating members will be invited to introduce the awardee and the award will be presented by the President.

## **STC V.E. Henderson Award**

**Background:** The Henderson Award is given in the name of Dr. Velyien E. Henderson, a former chairman of the Department of Pharmacology at the University of Toronto. This award was inaugurated by Dr. John D. McColl, one of the six founding members of the Canadian Association for Research on Drugs (CARD). The Henderson award was originally given by Dr. McColl and his wife Pat, who was a niece of Dr. Henderson, but the Society now sponsors the Henderson Award.

**Purpose:** The award is designed to honour an individual who has made a significant contribution to the discipline of toxicology in Canada.

### ***Application Process and Candidate***

#### ***Requirements:***

1. The candidate must be a Canadian citizen;
2. The candidate must have less than 15 years experience since obtaining his/her highest degree as of July 1 of the year in which the award will be given;
3. Candidates will be nominated by one ordinary member, in good standing, of the Society who will supply the Secretary with the following:
  - a supporting letter of recommendation;
  - a two-page summary (résumé) which describes the significant contribution(s) of the candidate;
  - a complete curriculum vitae plus a full list of publications, and
  - reprints of not more than five papers best representing the candidate's research.

**Selection:** The suitability of each nominated candidate will be reviewed by the Awards Committee consisting of the Past President (Chair), one Councillor and other ordinary members of the Society nominated by the Past President as required. To ensure that the contribution of each candidate to the discipline of toxicology is appropriately assessed, at least one member of the Selection Committee must have a working knowledge of the area of toxicology in which the candidate is working. When, in the opinion of the Selection Committee, two or more candidates are equally qualified, consideration of their involvement with STC activities might be

considered. The decision of the Selection Committee shall be final. Usually, only one award is made annually, but there have been two awards in a single year. However, there is no obligation or duty to make the award when, in the opinion of the Selection Committee, there is no qualified nominee. Once the Selection Committee has completed their deliberations, the Chairperson will report to the Board, who will in turn notify the successful nominee as appropriate. The Awardee will be asked to present a summary of his/her research during the Annual Symposium.

Applications should be mailed to the STC mailing address by July 1 (or by e-mail to the STC Secretariat).

The Award takes the form of an engraved plaque plus a cheque for \$500. The award will be presented at the President's reception. The nominating member of the Society will be invited to introduce the recipient and announce the award. The President will present the award. The nominating member will be asked to submit the text of the introduction to the Newsletter for publication.

## STC Annual Symposium

November 30 to December 2, 2008  
Delta Centre-Ville, 777 University  
Montreal, Quebec, Canada

### Title:

### Toxicity testing tomorrow: What does the future hold?

Abstract: Toxicity testing guidelines for the assessment of hazards already exist however new testing methods are emerging which will advance toxicity testing. A recent review by the US National Research Council entitled "*Toxicity Testing in the Twenty-first Century: A Vision and a Strategy*" has inspired the STC to examine the future of toxicity testing at our 2008 annual symposium (a summary of the US NRC report can be viewed at

[dels.nas.edu/dels/rpt\\_briefs/Toxicity\\_Testing\\_final.pdf](http://dels.nas.edu/dels/rpt_briefs/Toxicity_Testing_final.pdf)). This document was written in regards to environmental chemicals but the same vision can be applied to all classes of chemicals and drugs. The major components of the vision include improved compound characterization and *in vitro* toxicity testing, reduced and targeted *in vivo* toxicity testing, and improved dose-response, extrapolation modeling and population-based human biomonitoring data. The envisioned changes are expected to generate more robust data on the potential risks to humans posed by exposure to compounds and to expand capabilities to test compounds more efficiently. The vision is to provide an improved toxicity testing strategy which provides broad coverage of chemicals, chemical mixtures, outcomes and life stages; to reduce the cost and time of testing; to use fewer animals and cause minimal suffering in the animals used and to develop a more robust scientific basis for assessing health effects. A major focus of the vision is identification of toxicity pathways. This conference targets scientists in all sectors-government, industry, university, and consulting laboratories who design, conduct, and interpret toxicity tests and who use test results to evaluate risks to human health.

### Sunday, 30 November 2008

7:00 PM: Careers in Toxicology – Perspectives from Academia, Industry and Government  
Invited Guest: HR representative – Charles River Laboratories – The HR perspective

### Monday, 1 December 2008

AM Session: Toxicology testing of tomorrow: a regulatory perspective  
PM Session: Toxicology testing tomorrow: Compound characterization and *in vitro* toxicity testing.  
Special Student Workshop:  
Drug toxicity testing today

### Tuesday, 2 December 2008

AM Session: Toxicology of the future: *In vivo* toxicity testing, dose-response and extrapolation modeling  
PM Session: Toxicity testing strategies: Population-based and human biomonitoring data

We look forward to seeing you in Montreal!

## Conferences, Meetings, Symposia

Canadian Federation of Biological Sciences. 6<sup>th</sup> Northern lights Conference; The Biology of Aging, June 17-20, 2008, University of Manitoba, Fort Garry Campus, Winnipeg.

The Pharmacological Society of Canada Annual Meeting. July 26-31, 2008, Quebec City. In conjunction with The Clinical Pharmacology and Therapeutics 2008 Meeting.

Society of Toxicology of Canada Annual Symposium. November 30-December 2, 2008, Delta Centre-Ville, 777 University Avenue, Montreal, Quebec. *Toxicity testing tomorrow: What does the future hold?*

Society of Toxicology 48<sup>th</sup> Annual Meeting. March 15-19, 2009, Baltimore MD.