

*The 6th International Conference on*

# HORMESIS

**IMPLICATIONS FOR TOXICOLOGY,  
MEDICINE AND RISK ASSESMENT**

*The Annual Meeting of the  
International Hormesis Society*

**May 1-2, 2007**

**University of Massachusetts, Amherst, MA**

**Conference Directors: Edward J. Calabrese, Ph.D., Paul T. Kostecki, Ph.D.**



**THRESHOLD • ADAPTIVE • BIDIRECTIONAL • BIPHASIC  
HORMETIC • NON-MONOTONIC • U/J-SHAPED • PARADOXICAL**

# PLATFORM PRESENTATIONS

TUESDAY, MAY 1, 2007

## Morning

### Session I: PLENARY

8:30am – Noon

**Moderator:** A. Wallace Hayes, *Harvard School of Public Health, Cambridge, MA*

- 8:30am **Mechanisms of Action and Therapeutic Potential of Neurohormetic Phytochemicals**  
Mark Mattson, *National Institute on Aging Intramural Research Program, Baltimore, MD*
- 9:15am **Homeostasis: The Yin and Yang of Autoimmunity**  
Michal Schwartz, *The Weizmann Institute of Science, Rehovot, Israel*

10:00am **Break**

10:30am **How Low is Low Enough? Role of Science, Policy and Public Opinion**  
Roger O. McClellan, *Advisor, Toxicology and Human Health Risk Analysis, Albuquerque, MN*

11:15am **Annual Meeting of the International Hormesis Society**

Noon **Luncheon** *Amherst Room, 11th Floor Campus Center*

## Afternoon

### Session II: TOXICOLOGY

1:00pm – 3:05pm

**Moderator:** George Hoffmann, *Holy Cross College, Worcester, MA*

- 1:00pm **Activation of Adaptive Cellular Networks and Hormetic Dose Responses Relationships**  
Mel Andersen, Harvey J. Clewell, *CIIT Centers for Health Research, Research Triangle Park, NC*  
Annie M. Jarabek, *National Health and Environmental Effects Research Laboratory, US EPA, Research Triangle Park, NC*  
Qiang Zhang, Jingbo Pi, *CIIT Centers for Health Research, Research Triangle Park, NC*
- 1:25pm **Hormesis with Drug-induced Cytotoxicity**  
Peter J O'Brien, *University College Dublin, Belfield, Dublin 4, Ireland*
- 1:50pm **Non-Monotonic Dose-Toxicity Effects and Behavioral Function: Low-Dose Impairments from Developmental Pesticide Exposure**  
Edward D. Levin, Ph.D., *Duke University Medical Center, Durham, NC*

2:15pm **Hormesis with Herbicides: Glyphosate as a Case Study**  
Stephen O. Duke, Joanna Bajsa, Scott R. Baerson, *USDA, ARS, Natural Products Utilization Research, University, MS*  
Nina Cedergreen, *University of Copenhagen, Tåstrup, Denmark*  
Edivaldo D. Velini, *University of São Paulo State, Botucatu, Brazil*

2:40pm **Biological Properties in Genes for Low-Dose Regulation of the Embryonic Transcriptome**  
Thomas B. Knudsen, Amar V. Sing, *University of Louisville, Louisville, KY*

3:05pm **Break**

### Session III: BIOMEDICAL

3:30pm – 5:35pm

**Moderator:** Paolo F. Ricci, *University of Massachusetts, Amherst, MA*

- 3:30pm **Mechanisms Underlying the Bell-shaped Response of Neurons to Glutamate**  
Giles Hardingham, *University of Edinburgh, Edinburgh, Scotland*
- 3:55pm **Biphasic Action of Steroids on Neural Function: Mechanistic and Therapeutic Implications**  
Roberta Brinton, *University of Southern California, Los Angeles, CA*
- 4:20pm **Genes and Small Molecules that Extend Lifespan: Evidence for Xenohormesis**  
David Sinclair, *Harvard Medical School, Boston, MA*

4:45pm **Hormesis: Dermatologic Opportunities and Options**  
Howard Maibach, *University of California, San Francisco, CA*

5:10pm **Experimental and Clinical Information for the Possible Application of LDR-induced Hormesis and Adaptive Response in Medical Practice**  
Lu Cai, *The University of Louisville, Louisville, KY*

6:30pm **Social and Dinner** *Amherst Room, 11th Floor, Campus Center*

# PLATFORM PRESENTATIONS

WEDNESDAY, MAY 2, 2007

## Morning

### Session IV: MULTIPLE STRESSORS AND HORMESIS

8:30am – Noon

**Moderators:** Carmel Mothersill, *McMaster University, Hamilton, Ontario, Canada*  
William A. Bernhard, *University of Rochester Medical Center, Rochester, NY*

- 8:30am **Which DNA Damage is likely to be Relevant in Hormetic Responses?**  
Shubhadeep Purkayastha, *University of Rochester Medical Center, Rochester, NY*  
Jamie R. Milligan, *University of California at San Diego, La Jolla, CA*  
William A. Bernhard, *University of Rochester Medical Center, Rochester, NY*
- 8:55am **Interactions Between Chemicals and Radiation - 2+2 May Not Equal 4**  
John D. Zimbrick, Dmytro Grygoryev, Oleksandr Moskalenko, *Colorado State University, Fort Collins, CO*
- 9:20am **Biological Mechanisms of Radiation/Chemical Interactions Which Could Lead to Hormetic Radioprotective Effects**  
Carmel Mothersill, *McMaster University, Hamilton, Ontario, Canada*

9:45am **Break**

- 10:10am **Hormesis in Joint Action Studies with Phytotoxins from *Parthenium hysterophorus* L.**  
Regina G. Belz, *University of Hohenheim, Stuttgart, Germany*
- 10:45am **Targeted Radiotherapy: Microgray Doses and the Bystander Effect**  
Robert J. Mairs, Marie Boyd, *Glasgow University, UK*  
Beatson Laboratories, *Glasgow, Scotland*  
Michael R. Zalutsky, *Duke University Medical Centre, Durham, NC*  
Natasha E. Fullerton, *Crusade Laboratories Ltd, Glasgow, Scotland*
- 11:10am **Ethical and Philosophical Aspects of Dose-Response Models**  
Deborah Oughton, *Norwegian University of Life Sciences, Aas, Norway*
- 11:35am **Hormetic Effects and Legal Difficulties**  
Colin Seymour, Carmel Mothersill, *McMaster University, Hamilton, Ontario, Canada*
- Noon **Luncheon** *Reading Room, Campus Center*

## Afternoon

### Session V: RADIATION

1:00pm – 4:20pm

**Moderators:** Bobby Scott, *LRRI, Albuquerque, NM*  
Edouard Azzam, *New Jersey Medical School, Newark, NJ*

- 1:00pm **Mechanisms Underlying the Expression of Low Dose gamma-Ray-Induced Adaptive Responses in Human and Rodent Fibroblasts**  
Edouard Azzam, *New Jersey Medical School, Newark, NJ*
- 1:25pm **Evidence for Radiation Hormesis in Human Lymphocytes**  
Kanokporn Noy Rithidech, *Stony Brook University, Stony Brook, NY*  
Bobby R. Scott, *Lovelace Respiratory Research Institute, Albuquerque, NM*
- 1:50pm **Conferral of Immunity to Cancer and Other Diseases by Continuous Low Dose Radiation**  
Brenda Laster, Ilana Nathan, Jacob Gopas, *Ben Gurion University, Beer Sheva, Israel*  
John Kalef-Ezra, *University of Ioannina Medical School, Ioannina, Greece*
- 2:15pm **Low Doses, Cross Adaptation and Multiple Stressors**  
Ron Mitchel, Marilyne Audette-Stuart, Tamara Yankovich, *Atomic Energy of Canada Limited, Chalk River, ON, Canada*

2:40pm **Break**

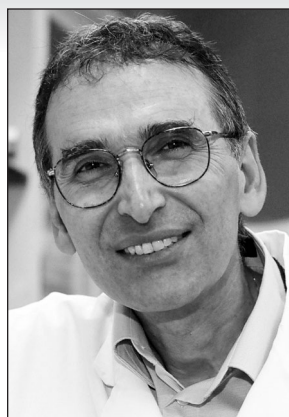
- 3:05pm **Exploring the mechanisms of the radioadaptive response at Chernobyl**  
Brenda Rodgers, *Texas Tech University, Lubbock, TX*  
Jeffery K. Wickliffe, *University of Texas Medical Branch, Galveston, TX*  
Kristen M. Holmes, M.D., *Anderson Cancer Center, Houston, TX*  
Adam D. Brown, *The University of Texas Health Science Center, San Antonio, TX*  
Robert. J. Baker, *Texas Tech University, Biological Sciences, Lubbock, TX*  
Ronald K. Chesser, *Texas Tech University, Lubbock, TX*
- 3:30pm **Recent Biological Results against the Validity of the LNT Hypothesis**  
Dietrich Averbeck, Didier Boucher, *Institut Curie-Section de Recherche, Orsay Cedex, France*
- 3:55pm **It's Time for a New Low-dose Radiation Risk Assessment Paradigm—One that Acknowledges Hormesis**  
Bobby R. Scott, *Lovelace Respiratory Research Institute, Albuquerque, NM*

*The International Hormesis Society is proud to announce the recipients of the first annual awards for **Career Achievement**, **New Investigator** and **Leadership**. These awards are presented to individuals in each category who have made outstanding contributions to the field of Hormesis. The awards committee selecting the recipients was **Helmut Hirsch**, University at Albany, **Ken Mundt**, Environ, and **Barbara Callahan**, University Research.*

*This years awards go to **Edouard Alexandre Azzam**, **Ronald E. J. Mitchel** and **Ernö Tyihák** for Career Achievement, **Nina Cedergreen** for New Investigator Achievement, and **Sadao Hattori** for Leadership. **Congratulations to all.***

## 2007 INTERNATIONAL HORMESIS SOCIETY AWARDS

### AWARDEE PROFILE: CAREER ACHIEVEMENT



#### **Edouard Azzam**

Edouard Azzam earned his Ph.D. degree in Radiation Biology from the University of Ottawa (Canada) in 1995. During his post-graduate studies and subsequent research career, he focused on characterizing the effects of low dose/low fluence ionizing radiation in normal human cells. He has shown that biological effects at low doses cannot be predicted from effects at high doses. He extended earlier studies in human lymphocytes and found that adaptive responses to g-radiation also exist in human and rodent fibroblasts. Pre-exposure to small doses of g-rays protected against DNA damage and carcinogenesis from subsequent exposures to higher

doses of radiation. In particular, under the mentorship of Professor Ron Mitchel, he found that exposure of mouse embryo cells to doses as low as 1 mGy reduced the level of chromosomal damage due to endogenous oxidative processes and decreased the frequency of neoplastic transformation to a level below the spontaneous rate. More recently, at his laboratory at the New Jersey Medical School where he is Associate Professor, he showed that low dose/low dose-rate g-ray exposures modulate cell cycle progression, and up-regulate anti-oxidant defenses and DNA repair activity in normal human fibroblasts grown under conditions encountered in vivo. While mitochondrial protein import and membrane potential were decreased by high dose g-radiation, they were enhanced by low doses. His ongoing studies have also revealed novel biomarkers of low dose exposures that are associated with cytoprotective properties. In addition, Edouard is pursuing research on propagation of radiation effects (i.e. the bystander response) that he began during his post-doctoral studies at Harvard University under the mentorship of Professor John Little. His data indicate that cytoprotective effects induced by low dose g-rays may be propagated to neighboring cells by intercellular communication mechanisms. Currently, his research is supported by the US Department of Energy, NIH, and NASA.



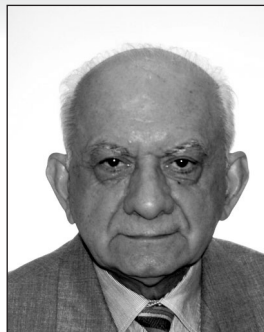


### ***Ron Mitchel***

Ron Mitchel was granted his Ph.D. degree in Biochemistry from the University of British Columbia in Vancouver and was subsequently awarded a postdoctoral fellowship in the UCLA School of Medicine's Department of Biochemistry. He then returned to Canada and joined the Radiation Biology & Health Physics Branch of Atomic Energy of Canada in Chalk River Ontario as a Research Scientist, where he has remained for the rest of his career. In the late 1970's he focused his research on radiation induced adaptive responses, and since then has lead the AECL low dose research program.

His research examines the biological effects and risks of ionizing radiation at the molecular, cellular and whole animal levels. Experimental models include yeast, human and other cells in culture, and rodents in vivo. Investigations focus on understanding the biological responses to low doses and low dose rates of high and low LET radiation and assessing their influence on radiation risk, including cancer and non-cancer diseases, heritable mutations and teratogenic effects. The central theme of the research is the adaptive response to radiation, a non-targeted hormetic effect of radiation and one aspect of a general response to stress. The genetic control of the adaptive response is examined in relation to DNA repair processes, cell cycle control and apoptotic signals, and the influence of these processes is being related to the biological control of low dose radiation risk in vivo. The implications of these biological processes for current theories of human and environmental radiation risk and radiation protection practices are being assessed.

Ron is now a consulting scientist at AECL, an adjunct professor of Biology at Laurentian University, Associate Editor of two scientific journals, and the author of numerous peer reviewed scientific publications. His research results, and their implications for the nuclear industry have been regularly presented at National and International conferences and to many nuclear industry groups. In 2003 he received the W. B. Lewis Medal, the highest honour jointly awarded by the Canadian Nuclear Society and the Canadian Nuclear Association.



### ***Ernő Tyihák***

Ernő Tyihák is a scientific adviser at Plant Protection Institute of Hungarian Academy of Sciences and lecturer at Budapest University of Technology and Economics (for chromatography, mainly overpressured layer chromatography, OPLC) as well as honorary professor at Szeged Science University, Szeged, Hungary. He is candidate of chemical sciences (PhD degree) (1978) in biochemistry and at that time he is Dr. techn. at Technical University of Budapest (1978) as well as he is doctor of chemical sciences (DSc degree) (1994) in analytical chemistry from Hungarian Academy of Sciences., Budapest, Hungary.

His main scientific achievements are as follows: finding of formaldehyde cycle and of formaldehydome system; discovering of double immune response of plants to pathogens; finding of non-linearity and molecular order in innate and induced resistance; discovering of double effect of trans-resveratrol (interaction between trans-resveratrol and formaldehyde); new approach to mechanism of action of trace elements; development of overpressured layer chromatography (OPLC as an analogy with HPLC) as well as of BioArena system (a complex bioautographic system). He is author of over 110 publications (among other in writing of 9 books) (mainly in English) (between 1975-2007) in the areas of chromatography, biochemistry, cell proliferation, immunization, oncology. He serves on the editorial board of the Journal of Planar Chromatography (JPC). He is named as inventor at 25 basic patents. He participates usually in international chromatographic and biochemical congresses as plenary lecturer or lecturer. He organized already 6 international conferences on Role of Formaldehyde in Biological Systems – Methylation and Demethylation Processes. He is member of the Hungarian Chemical Society and the Hungarian Biochemical Society, a member of Presidium of Hungarian Society for Separation Sciences and member of International Society for Planar Separations.

## 2007 INTERNATIONAL HORMESIS SOCIETY AWARDS

### AWARDEE PROFILE: NEW INVESTGATOR ACHEIVEMENT



#### ***Nina Cedergreen***

Nina Cedergreen was born in the western part of Denmark in 1969. In 1989 she began her Masters studies in biology at the University of Århus, Denmark, and completed her degree in 1997 with a M.Sc. in Ecological Plant Physiology. In January 2001, she defended her Ph.D. in plant adaptation to multiple stresses focussing on the physiological and morphological adaptation of aquatic plants to varying levels of nitrogen and light availability. Soon thereafter she was employed as an Assistant Professor at The Royal Veterinary and Agricultural University in Copenhagen, Denmark, working with the effect of pesticides on aquatic plants and algae. It was during this work that Dr. Cedergreen first observed the phenomenon of hormesis. As a stress physiologist it caught her curiosity and in 2005 she succeeded in getting a three-year research grant from the Danish Research Council to investigate the mechanisms behind hormesis in plants, together with the research's leader Steve Duke from the Natural Products Utilization Research Unit, USDA, Oxford, Mississippi. Since then Nina Cedergreen has been involved in developing statistical models to test for the presence of hormesis and has conducted a large database study to investigate the size and frequency of hormesis among several herbicides. Currently, Dr. Cedergreen is looking at hormesis in different plant endpoints (root and shoot growth, leaf elongation, stalk production, etc.) as well as over time after spraying. Also, she is examining the photosynthetic response to hormetic doses of herbicides to explain hormetic growth increases. Finally, gene expression in response to hormetic doses of glyphosate is being explored, again with Steve Duke's group at NPURU, USDA. Hopefully this important work of Dr. Cedergreen's will give us a larger insight into the physiological mechanisms behind hormesis in plants.

## 2007 INTERNATIONAL HORMESIS SOCIETY AWARDS

### AWARDEE PROFILE: LEADERSHIP



#### ***Sadao Hattori, PhD***

At the forefront of hormesis, for over 20 years Sadao Hattori has been a proponent of the hormetic effect of radiation. Having done extensive research in radiation hormesis and encouraging his colleagues to focus their studies in this direction as well, Dr. Hattori's extensive work, research, and lectures have been instrumental in bringing an understanding and appreciation of the low-dose effect to the scientific and medical communities. Dr. Hattori is now working to create a hormesis medical society in Japan. The International Hormesis Society salutes Dr. Hattori's work and efforts as he is at the vanguard of hormesis. We are honored to award him with this first award for outstanding leadership.

# ANNOUNCEMENT

## *7th International Conference on* **HORMESIS: IMPLICATIONS FOR TOXICOLOGY, MEDICINE AND RISK ASSESSMENT**

### *The Annual Meeting of the International Hormesis Society*

**APRIL 29 - 30, 2008**

*University of Massachusetts at Amherst*

- *Adaptive • Bidirectional • Biphasic • Hormetic • Non-Monotonic • Yerkes-Dodson Law (Psychology)*
- *U-Shaped • J-Shaped • Subsidy-Stress Gradient (Ecology) • Reverse Dose-Responses*

#### **TOPICS WILL INCLUDE:**

- Molecular mechanisms
- Pharmacological effects
- Chemical and radiation toxicology
- Risk assessment implications
- Low-dose modeling
- Evolutionary foundations
- Ecological effects
- Clinical/therapeutic effects
- Psychological/behavioral responses
- Bioengineering processes
- Exercise science
- Epidemiology of low doses
- Industrial hygiene
- Legal implications

*Please visit our website for more information, Abstract Submission Guidelines and Abstract Submission*

**[www.hormesisociety.org](http://www.hormesisociety.org)**

#### **For further Information contact**

Edward J. Calabrese, Ph.D. or Paul T. Kostecki, Ph.D.

Environmental Health Sciences • Morrill I, N344 • University of Massachusetts Amherst, MA 01003

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**DEADLINE FOR ABSTRACTS November 30, 2007**

### **INTERNATIONAL HORMESIS SOCIETY MEMBERSHIP**

The International Hormesis Society is a professional society designed to enhance understanding of the nature of the dose response and its implications for science and society.

Those individuals with a professional interest in these areas will be eligible for membership. Applications for membership can be found at [www.hormesisociety.org](http://www.hormesisociety.org). Annual membership rates are as follows:

**Individual Membership 1 Year \$125 (US)**

**Individual Membership 2 Years \$125 (US)**

**Reitree Membership 1 Year \$75 (US)**

**Reitree Membership 2 Years \$125 (US)**

**Post Graduate Membership 1 Year \$75 (US)** (up to three years post graduation)

**Post Graduate Membership 2 Years \$125 (US)** (up to three years post graduation)

**Student Membership 1 Year \$10 (US)**

**Student Membership 2 Years \$15 (US)**

**Sustaining Membership \$1000 (US)**

**Corporate Membership \$5000 (US)**

As part of the Society membership, each corporate and individual member will receive a subscription to the journal *Nonlinearity in Biology, Toxicology and Medicine*, which is a peer-reviewed quarterly journal. In addition there will be a Society Newsletter developed for the membership. Members will receive a 25% reduction in registration fees to the International Conference on Hormesis: Implications for Toxicology, Medicine and Risk Assessment, the Annual Meeting of the International Hormesis Society.

Applications should be mailed to:

**BELLE Office**

**Environmental Health Sciences Program**

**Morrill I, Room N344**

**University of Massachusetts**

**Amherst, MA 01003**

*To Become a Member, Visit*

**[www.hormesisociety.org](http://www.hormesisociety.org)**