

DE-FG02-09ER64724

Request for Travel Funds for Systems Radiation Biology Workshop

PROJECT SUMMARY/ABSTRACT

Title of the Project: Symposium Support for the 3rd International Systems Radiation Biology Workshop

Principal Investigator: Mary Helen Barcellos-Hoff, Ph.D., Director of Radiation Biology, Department of Radiation Oncology, New York University Langone School of Medicine, New York, NY 10016

Workshop Objectives

The 3rd International Systems Radiation Biology Workshop brought together the major European, US and Japanese research programs on radiation risk as well as selected experts representing systems biological approaches to discuss how the new methodologies could be best exploited for low dose research. A significant part of the workshop was devoted to discussions organised as breakout group sessions. To facilitate discussions number of participants was limited to 60 persons.

To achieve the goals of this symposium in this international conference, support from DOE is vital. Hence, this proposal requested support in the amount of \$15,000 to cover the travel expenses of international experts and radiation biology scientists from the United States. This supporting mechanism was clearly identified to the selected US participants as a conference support award from the DOE (See attached PDF). The workshop was an outstanding opportunity to strengthen interactions between leading experts in the emerging areas of radiation sciences, and will also provide opportunities for younger scientists to meet with experts and discuss their results. This workshop was designed to endorse active engagement in international collaboration. A major objective of this conference was to effectively communicate research results, in order to ensure that current thinking reflects sound science of radiation biology. Further, this international event addressed the use and success of scientific initiatives in radiation biology for policymakers, standard-setters, and the general public.

Speakers Invited and Supported by these Funds

"Mathematical modelling of the TGF-beta/Smad signalling pathway"

Caroline Hill

E-MAIL: caroline.hill@cancer.org.uk

Laboratory of Developmental Signalling

Cancer Research UK London Research Institute

Lincoln's Inn Fields Laboratories

44 Lincoln's Inn Fields

London WC2A 3PX UK

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"Interrogation of cell transformation mechanisms to identify susceptibility factors for low dose radiation health risks"

Tom Weber
Senior Research Scientist
Pacific Northwest National Laboratory
902 Battelle Boulevard
P.O. Box 999, MSIN P7-56
Richland, WA 99352 USA
Tel: 509-376-2318
Fax: 509-376-6767
thomas.weber@pnl.gov
<http://www.sysbio.org/resources/staff/weber.stm>

"Improved Understanding of Tumor Progression through Computational Tracking of Cancer Cell Dynamics"

Heiko Enderling
Center of Cancer Systems Biology, Caritas St.
Elizabeth's Medical Center
Postdoctoral Fellow, Tufts University School of Medicine
736 Cambridge Street
Boston, MA 02135, USA
Heiko.Enderling@tufts.edu

"What can systems biology tell us about radiation risk?"

Mary Helen Barcellos-Hoff
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Systems Biology, Radiation Biology, and DOE

Systems biology is a new field that integrates high throughput technology, multi-scale biological modelling, and bioinformatics to drive new insights into fundamental biological problems.

Although much is known about the quantitative effects of exposure to ionising radiation considerable uncertainties remain about the health effects at low doses and the importance of low dose risk is increasingly being recognised globally. Recent research findings imply that the biological processes operating at low doses may be partly different from those acting at high doses. Furthermore, non-targeted effects such as bystander effects and genomic instability imply that that the cellular and tissue responses to low dose radiation are very complex. Therefore, new systems biological approaches are needed to understand the low dose processes and to complement the biophysical research tradition of the radiobiological community.

The integration of data and complex modelling has long been strength of DOE funded research. DOE has been a ground-breaking leader in developing technologies, as exemplified by the Human Genome Project and GTL that enable systems biology approaches. The National laboratories have prominent Systems Biology leaders such as Jay Keasling, Adam Arkin, Joe Gray, and Steve Wiley. The new integration of biology programs in Biological

Systems Science division at OBER underscores the need to understand how systems work across the research problems from climate to genomics to radiation health effects.

The primary goal of the Department of Energy's Low Dose Radiation Research Program is to support research that will help determine health risks associated with exposure to low levels of radiation. Radiation-induced cancers are predicted from low doses of radiation for which it has not been possible to directly demonstrate cancer induction. The major theme of the research supported by the DOE Low Dose Radiation Program from the Office of Biological and Environmental Research Programs. These topics directly fit into the inter-related research areas of DOE to understand how molecular, cellular and tissue responses to radiation interact at low doses. Such data and expertise is necessary for the goal of better predicting risk from very low dose or dose rate exposure in humans and is critical to adequately and appropriately protect people while making the most effective use of our national resources.

It is particularly apparent that regulatory models of radiation risk are historically reductionist, to the point of recent National Academy of Sciences report that stated that no dose of radiation was too small not to have an effect. While the regulatory paradigm began as a pragmatic solution to protecting the public, it has become entrenched in a linear-no-threshold paradigm based on observations that initial radiation damage is linear with dose. However the subsequent biological response to damage is much more complex. As highlighted in the DOE Low Dose program, organisms have robust systems to handle DNA damage at the cellular level, to eliminate aberrant cells, and to suppress disease processes. The concept that radiation elicits non-targeted effects that occur in unirradiated cells or the progeny of irradiated cells is now well-documented, and may potentially counter the linear damage hypothesis of health effects. The challenge is to integrate all the data to understand how a biological system (a tissue, an organism) actually processes damage, and to identify hubs that control these processes.

The series of workshops on Systems Radiation Biology was originally an outgrowth of discussions that occurred at the 2006 Low Dose Investigator's Meeting. The first meeting was sponsored by EU community project, RISC-RAD in Munich, Germany in January 2007. The second meeting was held immediately following the last Low Dose Investigator's meeting in Washington, D.C. in January 2008 (<https://www.ornl.gov/sysradio2008/default.htm>). Both were well attended by an international community of scientists whose expertise ranged from radiation biology to systems genetics. The main objective of the International Workshop is to develop new concepts in radiation biology that integrate multi-scale information. To do so, highly accomplished scientists have been invited to speak on subjects ranging from wound healing to pattern formation in fish that showcase novel systems biology approaches.

The 3rd Workshop in the series was hosted by STUK – Radiation and Nuclear Safety Authority, Helsinki, Finland. Other sponsors are:

- NOTE - Non-targeted effects of ionising radiation Integrated project, Euratom, European Commission
- CARDIORISK - Mechanisms of cardiovascular risks after low radiation doses, Euratom, European Commission
- GENRISK-T - Defining the genetic component of the low dose risk of thyroid cancer, Euratom, European Commission
- NASA – the National Aeronautics and Space Administration, USA
- Japan radiation research projects

International Programme Committee

- o Sisko Salomaa (chair), STUK, Finland
- o Eric G. Wright, University of Dundee, UK
- o Yuri Dubrova, University of Leicester, UK
- o Soile Tapio, Helmholtz Center Munich
- o Mike Atkinson, Helmholtz Center Munich
- o Mary Helen Barcellos-Hoff, New York University, USA
- o Noelle F. Metting, Office of Biological and Environmental Research, DOE, USA
- o Francis Cucinotta, Johnson Space Center, NASA, USA
- o Ohtsura Niwa, Kyoto University, Japan

PROGRAM

3rd International Systems Radiation Biology Workshop

12-14 January 2009

Rovaniemi, Finland

Monday, 12 January

08.00-08.50 Registration

08.50-09.00 Welcome: Sisko Salomaa

Session: Tissue systems

09.00-09.30 Lecture 1: Mary Helen Barcellos-Hoff/

09.30-10.00 Lecture 2: David Noble /Modelling of heart

10.00-10.30 Coffee break

10.30-11.00 Lecture 3: Oleg Belyakov/3D Tissue systems

11.00-11.30 Lecture 4: Eric Wright/

11.30-12.00 Lecture 5: Carmel Mothersill/

12.00-13.00 Lunch

Session: Systems biology approaches related to radiation effects and disease ethiology

13.00-13.30 Lecture 6: Alison Dunning/Genome-wide SNPs mining, cancer predisposition and radiosensitivity

13.30-14.00 Lecture 7: Dariusz Leszczynski/Omics in EMF research

14.00-14.30 Lecture 8: Heiko Enderling/Tufts University /Agent Modeling of Cancer)

14.30-15.00 Lecture 9: Nils Cordes/

15.00-16.00 Coffee break and posters

Session: Modelling and bioinformatics

16.00-16.30 Lecture 10: David Brenner/

16.30-17.00 Lecture 11: Francis Cucinotta/

17.00/17.30-19.00 Reception

20.00→ Ice bar

Tuesday, 13 January

Session: Future visions in “Omics” technologies

09.00-09.30 Lecture 12: Matt Hurles

09.30-10.00 Lecture 13: Olli-Pekka Kallioniemi/ (Omics)

10.00-10.30 Coffee break

10.30-11.00 Lecture 14: David Fell

Session: Questions to breakout sessions

11.00-11.20 Moderator lecture 1: Use of “Omics” approaches and high throughput techniques to solve the issue of low dose risk: Legrain, Brenner, Cucinotta, Paretzke,

11.20-11.40 Moderator lecture 2: How to identify biomarkers bridging the gap between exposure and final health effects : Morgan, Atkinson, Niwa, Sakai

11.40-12.00 Moderator lecture 3: How systems biology can help to solve issues of tissue response and individual sensitivity: Barcellos-Hoff, Belyakov Metting, Cucinotta, Sabatiea...

12.00-13.00 Lunch break

13.00-17 **Parallel break-out sessions**

Breakout 1: Do “Omics” approaches and high throughput techniques motivate systems biology modelling of radiation response?

Moderator: Prof. Mats Harms-Ringdahl (*Stockholm University, Sweden*)

Rapporteur: Dr. Janet Hall (*Institute Curie, France*)

- How high throughput techniques have been used by radiobiology so far?
- Reproducibility of system responses to radiation. Is there a signature for radiation exposure of LET?
- New approaches in mathematical modelling of radiation systems biology data
- Utilisation of “omics” approaches in biodosimetry.
- Would high throughput techniques be useful for radiation protection?

Breakout 2: How can biomarkers bridge the gap between exposure and final health effects in terms of individual sensitivity?

Moderator: Dr. Michael Atkinson, (*Helmholtz Center Munich, Germany*)

- What biomarkers are used to predict individual sensitivity to radiation exposures? Are they all reliable enough? Do we need more of them?
- Could high throughput techniques be helpful in finding new biomarkers for individual sensitivity studies?
- Could we use experience of cancer biology biomarker studies for radiation protection?
- How useful and practicable biomarkers are versus systems biology for individual sensitivity studies. What might be the situation in the future?

Breakout 3: Can systems biology help to solve the issue of predicting low dose health effects?

Moderator: Dr. Mary-Helen Barcellos-Hoff (*New York University, USA*)

- Are systems biology methods sensitive enough to study low dose radiation effects?
- What can we learn from high dose systems biology studies?
- Is the systems biology a reliable source of information to predict low dose health effects?
- How collaborative studies of low dose health effects using systems biology approaches can be arranged? Is there a need for international network?

Evening Dinner and Reception

Wednesday, 14 January

Session: Conclusions from breakout sessions

Chair: Sisko Salomaa

09.00-10.30 Moderators reports

10.30-11.00 Coffee break

11.00-12.00 General discussion

12.00-12.30 Conclusion and future perspectives/Sisko Salomaa

12.30-13.30 Lunch

Budget Justification

\$15,000 for 4 Invited Speakers and the DOE Low Dose Chief Scientist (5 persons) to attend the 3rd *International Systems Radiation Biology Workshop*

- Travel to Arktikum, Rovaniemi, Finland from the US assuming:
- January 11 departure from US
- January 15 departure from Finland
- Approximate cost to Helsinki on American Carriers: \$2000
 - *Examples*
 - American Airlines from \$1676 Roundtrip New York (JFK) Helsinki (HEL)
 - United Airlines from \$1080 Roundtrip Houston (HOU) Helsinki (HEL)
 - United Airlines from \$2700 Roundtrip New York (JFK) Helsinki (HEL)
- Registration fees and transfer to Rovaniemi will be covered by EU partners
- Hotel, transfer and per diem: \$1000

 NOTE - TOWARDS A NEW PARADIGM

Third International Systems Radiation Biology Workshop

12-14 January 2009
Arktikum, Rovaniemi, Finland

Non-targeted effects of ionising radiation

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 NOTE - TOWARDS A NEW PARADIGM


NOTE Local Organising Committee STUK – Radiation and Nuclear Safety Authority

- Oleg Belyakov (chair)
- Virpi Launonen
- Liisa Sirikka
- Anne Kreula
- Samu Inkinen








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 NOTE - TOWARDS A NEW PARADIGM

Host and organisers

- Hosted by STUK – Radiation and Nuclear Safety Authority, Helsinki, Finland
- Supported by:
 - NOTE - Non-targeted effects of ionising radiation Integrated project, Euratom, EC;
 - CARDIORISK - Mechanisms of cardiovascular risks after low radiation doses Collaborative project, Euratom, EC;
 - GENRISK-T - Defining the genetic component of the low dose risk of thyroid cancer STREP project; Euratom, EC;
 - Low Dose Research Program of the US-DOE Office of Biological and Environmental Research;
 - NASA – the National Aeronautics and Space Administration, USA;
 - Japan radiation research projects.

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 NOTE - TOWARDS A NEW PARADIGM

Organising and Program Committee

- Sisko Salomaa (chair), STUK – Radiation and Nuclear Safety Authority, Helsinki, Finland.
- Eric G. Wright, University of Dundee, UK.
- Yuri Dubrova, University of Leicester, UK.
- Soile Tapio, Helmholtz Center Munich: German Research Center for Environmental Health, Germany (or other CARDIORISK representative).
- Mike Atkinson, Helmholtz Center Munich: German Research Center for Environmental Health, Germany.
- Mary Helen Barcellos-Hoff, Lawrence Berkeley National Lab, USA.
- Noelle F. Metting, Office of Biological and Environmental Research, DOE, USA.
- Francis Cucinotta, Johnson Space Center, NASA, USA.
- Ohtsura Niwa, Kyoto University, Japan, USA.


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Tentative venue

- Rovaniemi, capital of Lapland located in northern Finland;
- It is situated at the Arctic Circle;
- Easily accessible by plane via Helsinki airport;
- Home of STUK's Regional Laboratory in Northern Finland



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Organisational details

- Significant part of the workshop will be devoted to discussions organised as breakout group sessions.
- To facilitate discussions number of participants will be limited to 60 persons.
- Proceedings of the workshop to be published as a special issue Radiation Research
- Registration for the workshop will be started in August 2008.
- Deadline for accommodation booking is 31 October 2008.

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 **NOTE - TOWARDS A NEW PARADIGM**

Topics and Programme

- **Day 1.** Invited lectures and talks from participating projects representatives (NOTE, CARDIORISK, GENRISK-T, US DOE Low Dose Research Program, NASA and Japanese partners)
Reception in Arktikum.
- **Day 2.** Three moderated parallel breakout group sessions on selected topics:
 - Use of "Omics" approaches and high throughput techniques to solve the issue of low dose risk
 - How to identify biomarkers bridging the gap between exposure and effect/disease
 - How system biology can solve issue of individual sensitivity in radiation biology/radiation protection studies.
 Working dinner. Herwig Paretzke will speak about physics of Aurora Borealis.
- **Day 3.** Moderators reports on Breakout Groups output. General discussion, conclusions and future prospective.

Arctic Circle sightseeing after lunch.

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 **NOTE - TOWARDS A NEW PARADIGM**

Venue – Arktikum conference centre



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<http://www.sysradbio2009.org/>



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