

Biomarkers of Radiation in the Environment

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Biomarkers of Radiation in the Environment

Robust Tools for Risk Assessment

edited by

Michael D. Wood

School of Science, Engineering and Environment
University of Salford
Salford, UK

Carmel E. Mothersill

McMaster University
Hamilton, ON, Canada

Gohar Tsakanova

Institute of Molecular Biology NAS RA
Yerevan, Armenia

Tom Cresswell

Australian Nuclear Science and Technology Organisation, ANSTO
Lucas Heights, NSW, Australia

and

Gayle E. Woloschak

Feinberg School of Medicine
Northwestern University
Chicago, IL, USA



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*To our friend and colleague Margarita
Malakyan, whose warmth, kindness and
dedication to science and the promotion of
collaborative research enabled this workshop
to occur in Armenia and gave us all an
opportunity to visit this ancient country and
learn about its history.
Always remembered.*

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About This Book

This book presents papers from an Advanced Research Workshop sponsored by the North Atlantic Treaty Organisation (NATO). The workshop, '*Biomarkers of Radiation In The Environment: Robust tools for risk assessment (BRITE)*', took place in Yerevan, Armenia from 27th – 30th November 2017. It brought together more than 40 international scientists from a broad range of disciplines including environmental protection, radiation metrology, radiobiology and radioecology.

The aim of the workshop was to identify biomarkers that are practical for use in the field and are robust enough to aid in risk assessment. Biomarkers were loosely defined as biological indicators of change that can be used to identify exposure events and inform risk assessment.

For effective use of biomarkers in an environmental context, biomarker samples need to be collected non-lethally. Otherwise it is difficult to justify that the use of BRITE is helping to ensure protection of wildlife. In human biomarker research, non-lethal sampling is clearly the norm. Therefore, the BRITE workshop facilitated knowledge exchange between the radiobiology and radioecology communities. Insights from cancer research, epigenetics and risk assessment (both human and non-human) were discussed, recognising that state-of-the-art biomarkers being developed for humans deserve consideration for environmental applications and vice versa. Sessions were wide-ranging, covering methods, mechanisms, cross disciplinary application and regulation.

The chapters in this book have been grouped into five major themes that were covered by the BRITE workshop:

- Techniques for biomarker development
- Low-dose effect mechanisms
- Biomarkers for risk evaluation
- Biomarkers in wildlife
- Biomarker use and responses

Each chapter has been written independently and reflects the views of the chapter author(s), allowing the reader to form their own balanced view of the different perspectives on biomarkers of radiation in the environment. Given the breadth of topics covered and the state-of-the-art perspectives shared by leading experts in their respective fields, this book should form a valuable resource for anyone with an interest in how biomarkers can be used to improve our understanding of radiation in the environment and its potential impacts.

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About the Editors

Michael D. Wood is Professor of Applied Ecology at the University of Salford, UK. A Chartered Radiation Protection Professional, his radioecological research focuses on the behaviour, fate and impacts of radionuclides in the environment. This research has led to various prestigious awards, including the Times Higher Education award for research and the Society for Radiological Protection's Founders' Medal. A regular keynote speaker at international conferences, Professor Wood has also acted as an invited expert for the International Atomic Energy Agency and the European Commission in the area of environmental radiation protection. Beyond his core scientific research, Professor Wood is internationally recognised for his expertise in communicating radiation science and risk, including the innovative use of virtual reality to engage audiences with his Chernobyl-based research.

Carmel Mothersill is a Professor and Canada Research Chair in Environmental Radiobiology at McMaster University in Canada. Her research is focused on low dose effects of radiation, in particular non-targeted effects where radiation effects are seen in cells and organisms that have not received a direct dose of radiation but receive signals from irradiated cells or organisms. Professor Mothersill has received many prestigious awards including the Nikolai Timofeev-Ressovsky award from the Russian Academy of Sciences, The Marie Curie medal, and the St Luke's Lecture and medal from the Irish Academy of Medicine. She also received an Honorary Doctorate from Heriot Watt University in Scotland. Professor Mothersill has organised a number of international conferences and workshops including the International Congress on Radioecology and Environmental Radiation in Canada and the International Congress of Radiation Research in Ireland. She is currently Treasurer of the International Union of Radioecologists.

Gohar Tsakanova is the deputy director and senior scientist at the Institute of Molecular Biology NAS RA, and head of Laboratory of Experimental Biology and senior scientist at CANDLE Synchrotron Research Institute, Yerevan, Armenia. Her primary work is related to the molecular and cellular pathomechanisms of cerebrovascular diseases, aging and radiation biology aiming to development of effective

treatment strategies. She is member of editorial board and reviewer of a number of international scientific journals, member and co-chair of international grant programs on radiobiology.

Tom Cresswell is a Senior Research Scientist in Ecotoxicology at Australia's Nuclear Science and Technology Organisation (ANSTO). He uses nuclear techniques to understand the fate and impacts of a range of anthropogenic contaminants on aquatic organisms. Dr Cresswell has been invited to several key international meetings other than BRITE, including the Plastics Awareness Global Initiative (PAGI) held at UC San Diego in 2018 and several expert meetings organised by the International Atomic Energy Agency (IAEA) on using nuclear techniques in marine plastics research and using radioecological tracers to determine coastal and marine ecosystem health. Dr Cresswell is a board member of Science and Technology Australia (STA), a peak body representing over 70,000 STEM professionals across the country and holds executive board positions for the Society of Environmental Toxicology and Chemistry (SETAC) Australasia and the South Pacific Environmental Radioactivity Association (SPERA). He regularly participates in science outreach activities and STEM communication events to inspire the next generation of environmental scientists.

Gayle E. Woloschak is Professor of Radiation Oncology, Radiology, and Cell and Molecular Biology in the Feinberg School of Medicine, Northwestern University. Gayle received her B.S. in Biological Sciences, from Youngstown State University and a Ph.D. in Medical Sciences from the University of Toledo (Medical College of Ohio). She did her postdoctoral training at the Mayo Clinic, and then moved to Argonne National Laboratory until 2001. Her scientific interests are predominantly in the areas of Molecular Biology, Radiation Biology, and Nanotechnology studies, and she has authored over 200 papers. She is editor-in-chief for the International Journal of Radiation Biology, is past-President of the Radiation Research Society, is a member of the National Council of Radiation Protection and Measurements, is a member of Committee-1 for the International Commission on Radiation Protection and serves on a committee studying low dose radiation effects for UNSCEAR. She is also Associate Dean of Graduate Student and Postdoctoral Affairs in The Graduate School at Northwestern University.