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Dariusz Leszczynski
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Radiation Proteomics

The effects of ionizing and
non-ionizing radiation on cells
and tissues

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Preface

Proteomics is widely used in search of biomarkers, in pharmacology, in clinical research and in toxicology. With the help of proteomics, large amount of information on the physiology of living cells can be obtained in a single experiment. Combining this information with the data from genomics and other high-throughput screening techniques, like transcriptomics and metabolomics, allows researchers to gain new insights into the normal and pathological physiology of cells, tissues and organisms.

The area still waiting for the proteomics “boom” is the search for the biological effects of radiation. The effects caused by high doses of radiation, both ionizing and non-ionizing, are relatively well known. However, much less is known about the effects of low or very low doses of radiation to which people are exposed in their everyday life. The knowledge of the effects of the low doses of ionizing radiation (e.g. bystander effect) or low doses of non-ionizing radiation (e.g. effect of radiation emitted by wireless communication devices) is not yet reliably established. Often the effects are small and difficult to discover and to replicate. One of the limiting factors in the research of low-dose radiation effects has been the lack of the knowledge of the cellular target molecules. Now the discovery of molecular targets of radiation is within the reach while using proteomics, the high-throughput screening of expression and activity of proteins. Particularly, in studying biological effects of low-dose radiation, proteomics approach might reveal effects not possible to predict based on the available knowledge of the effects caused by high doses of radiation.

Search through the scientific literature shows that to date there have been published only a very limited number of proteomics studies examining effects of radiation. This book, *Radiation Proteomics*, presents the current status of the research of radiation effects using proteomics approach.

This book begins with the review of current status and the future directions in the development of proteomics methods written by the group of Timothy J. Griffin from the University of Minnesota, Minneapolis, USA. This introductory chapter is followed by two chapters dealing with the effects of ionizing radiation on cells and on tumor microenvironment co-authored by Soile Tapio and Michael J. Atkinson from the Helmholtz Centrum Munich, Germany. Two other chapters dealing with the effects of ionizing radiation present an overview of the radiation effects detectable in the serum proteome, written by Olivier Guipaud from the Institute of Radioprotection and Nuclear Safety in France, and in the urine proteome, co-authored by Mukut Sharma

and John E. Moulder from the Medical College of Wisconsin, USA. The next four chapters deal with the effects of non-ionizing radiation. Two other chapters review the impact of electromagnetic fields, the radiofrequency-modulated electromagnetic fields (RF-EMF) and extremely low frequency magnetic fields (ELF-MF), written by Dariusz Leszczynski of the STUK-Radiation and Nuclear Safety Authority, Finland and by Guangdi Chen and Zhengping Xu of the Zhejiang University, China, respectively. The last two chapters by H. Konrad Muller and Gregory M Woods of the University of Tasmania and the Menzies Research Institute Tasmania, Australia and by Riikka Pastila of the STUK-Radiation and Nuclear Safety Authority, Finland, review the effects of non-ionizing ultraviolet radiation on skin cells.

I would like to thank all authors for taking time off their busy schedules to write these interesting reviews. I hope that this book will help to stimulate research in the area of radiation effects on proteome and facilitate discoveries of target molecules, especially in the area of low-dose radiation, both ionizing and non-ionizing.

Finally, I would like to thank Thijs van Vlijmen, Publishing Editor and Sara Germans-Huisman, Publishing Assistant, from the Springer Science + Business Media B.V., for their help support and patiently waiting for the delayed materials.

Melbourne, Australia
October 2012

Dariusz Leszczynski

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