

PREFACE • OPEN ACCESS

1st Nano-IBCT Conference 2011 – Radiation Damage of Biomolecular Systems: Nanoscale Insights into Ion Beam Cancer Therapy

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Preface

The 1st Nano-IBCT Conference entitled ‘Radiation Damage in Biomolecular Systems: Nanoscale Insights into Ion Beam Cancer Therapy’ was held in Caen, France, in October 2011. The Meeting was organised in the framework of the COST Action MP1002 (Nano-IBCT) which was launched in December 2010 (<http://fias.uni-frankfurt.de/nano-ibct>). This action aims to promote the understanding of mechanisms and processes underlying the radiation damage of biomolecular systems at the molecular and nanoscopic level and to use the findings to improve the strategy of Ion Beam Cancer Therapy. In the hope of achieving this, participants from different disciplines were invited to represent the fields of physics, biology, medicine and chemistry, and also included those from industry and the operators of hadron therapy centres.

Ion beam therapy offers the possibility of excellent dose localization for treatment of malignant tumours, minimizing radiation damage in normal healthy tissue, while maximizing cell killing within the tumour. Several ion beam cancer therapy clinical centres are now operating in Europe and elsewhere. However, the full potential of such therapy can only be exploited by better understanding the physical, chemical and biological mechanisms that lead to cell death under ion irradiation. Considering a range of spatio-temporal scales, the proposed action therefore aims to combine the unique experimental and theoretical expertise available within Europe to acquire greater insight at the nanoscopic and molecular level into radiation damage induced by ion impact. Success in this endeavour will be both an important scientific breakthrough and give great impetus to the practical improvement of this innovative therapeutic technique. Ion therapy potentially provides an important advance in cancer therapy and the COST action MP1002 will be very significant in ensuring Europe’s leadership in this field, providing the scientific background, required data and mechanistic insight which are indispensable for the optimization of this new therapy.

The conference gathered 115 participants originating from 28 countries and addressed a large number of highly relevant aspects concerning ion propagation in biological matter, the production of secondary particles along the ion tracks as electrons, holes and radicals, and their propagation in the biomolecular medium. In particular, the attack of DNA molecules and proteins by electrons and free radicals, the relative importance of direct and indirect damage processes as well as the role of the environment were discussed. Not only were fundamental mechanisms and processes elucidated, but radiobiological scale effects, multi-scale approaches and recent advances in the theoretical description of the underlying complex phenomena were also presented. Aspects linked to the energy deposition (LET), the characteristics of the Bragg peak and new techniques of dosimetry and radiolysis were highlighted. Furthermore, methods for increasing the therapy efficiency by using radio sensitizers and the state-of-the-art of defining precise patient treatment plans, identifying the clinical benefits of this type of therapy, were also addressed.

We would like to thank all participants for the lively exchange of ideas and results, thus making this conference a very fruitful event. Furthermore, we appreciate the financial support of the sponsors of this conference, in particular of the COST Action MP1002 financed by ESF. We would also like to express our thanks to all authors of these proceedings, as well as to the reviewers for their time, efforts and recommendations made during the preparation of this volume. Finally, many thanks to U G Huber for a

careful proof-read of this manuscript.

We look forward to the 2nd Nano-IBCT Conference, which will be held in spring 2013.

Caen, 15 March 2012

Bernd A Huber, Christiane Malot, Alicja Domaracka and Andrey V Solov'yov

The Editors



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The Conference has been organised in the framework of the COST Action MP1002 (Nano-IBCT: Nanoscale Insights into Ion Beam Cancer Therapy). Details can be found on the following website: <http://fias.uni-frankfurt.de/nano-ibct>

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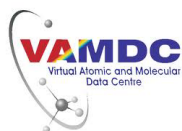
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