Preface

Boron Neutron Capture Therapy (BNCT) is based on the ability of the non-radioactive isotope boron-10 to capture with a very high probability thermal neutrons. This nuclear reaction produces two high-LET particles (He-4 and Li-7) with ranges in tissue limited to the diameter of a single cell. This offers the possibility to target single tumor cells and to destroy them with high efficiency while sparing other tissues containing less boron-10. Such a radiotherapy on the cellular level can provide an extremely precise dose delivery allowing to efficiently treat tumors and to reduce side effects. It also has the potential to successfully treat types of cancer that are actually incurable.

In recent years major progress was made in conventional radiation oncology to improve precision. However, the radiation dose still has to be delivered to a volume that necessarily also includes normal tissues. Even more so, physicians have to define this volume, which depends from the imaging modalities available and which will vary from one physician to another. BNCT with its biological targeting of single cells has the potential to overcome these inherent problems of conventional radiotherapy.

However, the success of BNCT is not guaranteed. It depends on two conditions: the preferential uptake of boron-10 atoms into each cancer cell and the delivery of a high fluence of thermal neutrons into the target volume. To realize these technical and biological prerequisites, BNCT needs multi-disciplinary science relying on the collaboration of medicine and biology, nuclear and medical physics, chemistry and pharmacology, mathematics and information technologies.

This book has brought together a number of reputable clinicians and scientists in the field of BNCT, who have collaborated to write chapters covering the whole range of topics within BNCT. It has been designed as a guide to BNCT providing the reader with a definitive, authoritative, and comprehensive review of the topic. For the editors, it was a challenging task to coordinate this multi-disciplinary and multi-cultural approach. The reader may appreciate the resulting variety but he will also recognize the need of further development of standards in the reporting of BNCT.

After more than 50 years of research in BNCT, substantial progress is now within reach: Hospital-based accelerators delivering high intensity epithermal neutron beams will facilitate clinical trials and will allow for the inclusion of more patients into such trials. This creates a market attractive for the pharmaceutical industry, which is mandatory for any new drug development in BNCT. We therefore see

a great future for BNCT and we sincerely hope that all the efforts necessary to realize this book will help to advance all aspects of BNCT. We would like here to take the opportunity to express our gratitude to Mrs. Reiko Matsuoka, who supported and accompanied the development of BNCT from its beginning. She entered the topic as Prof. Hatanaka's secretary and after he passed away she promoted the International Society for Neutron Capture Therapy supporting congresses around the world and facilitating exchange between Japanese and non-Japanese scientists. Her continuous voluntary engagement behind the scenes has been a tremendous support for many colleagues working in the field.

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