

# 1. Outline of Research Activities



Five years have passed since the National Institute of Radiological Sciences (NIRS) was reformed as an Independent Administrative Institution (IAI) in April 2001, and this fiscal year (2005-2006) is the last year in the first Mid-term Plan of NIRS. I am delighted to be able to proudly report here the very smooth and efficient achievement of research activities, successful completion of all the research programs in the first Mid-term Plan, and smooth start of the second (new) Mid-term Plan from April 2006.

The seven projective research programs in the first Mid-term Plan were: the heavy ion clinical trials, the development of four-dimensional X-ray CT, the next generation PET project, the RadGenomic project, the low dose radiation effects research project, the project on biological and physical protection of man from space radiation, and the study for radiation emergency medical preparedness. Details of these project studies and some fundamental studies to support them will be represented in the following pages. Some other research programs were also continued or newly started with supports of funding agencies including the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Economy, Trade and Industry, the Ministry of Environment, and so on.

The clinical study of cancer treatment using with the Heavy Ion Medical Accelerator (HIMAC) was much progressed and was ranked as “S (very advanced program)” by the IAI Evaluation Committee of MEXT. In this program, approximately 400 patients were treated this year, and total number of patients reached more than 2600 by the end of March 2006. To promote and spread this extremely effective therapy world wide, many symposia, seminars, and workshops were held, including the NIRS-MedAustron Joint Symposium on Carbon Ion Therapy in Cancer that was held Innsbruck, Austria. The developmental study of medical imaging apparatus was also much progressed. The test machines for four-dimensional computer tomography (three-dimensional imaging with time lapse) and high sensitivity/resolution positron emission tomography (PET) were constructed and in evaluations they demonstrated excellent performance as expected. The research programs on the health effects of low dose radiation, space radiation protection, and radiation genomics also obtained many accomplishments this year. It was our great honor and privilege to be designated as the Collaborating Center of International Atomic Energy Agency (IAEA) in this field.

Among fundamental research programs, there are some that must be mentioned here. The brain research programs and the medical imaging study were newly funded by MEXT, reinforced, and scaled up to the Research Center for Molecular Imaging. This center will carry out activities as one of two national centers for molecular imaging. The developmental study of the compact accelerator was completed successfully. The basic design and concept of the major parts of the accelerator will be provided to Gunma University which is planning to built a new compact type heavy ion accelerator for cancer therapy.

The results of our research activities were disseminated in many ways. The most important was as research papers in scientific journals. The number of original papers published by NIRS members was over 280 papers, and many of them were published in international journals with good reputations. Furthermore, we had more than 160 proceedings at international or domestic scientific meetings, 450 oral presentations, and 50 patent applications. Collaborative studies and exchanges of reserchers were also very active: 84 collaborative studies were carried out, 1200 resarchers worked as visiting stuff, and 280 students were accepted as trainees.

Much effort was made to construct the second Mid-term Plan, based on the successful accomplishments of the first Mid-trem Plan. The second Mid-trem Plan started in April 2006, and all the research activities are now progressing very smoothly.

We look forward to reporting the progress of the second Mid-term Plan in next year's Annual Report. I would like to finish with heartfelt thanks for cooperation and advice given to us during the year 2006.

Sentaro Takahashi, Ph.D.,  
Executive Director for Research