

Prof Prakash Hande and Dr. Akira Fujimori collaborate on mouse studies using Fe/C ions

(A03-1) “Multidisciplinary Analysis of the Effect of Low Fluence Particle Radiation on Animals and Biological Adaptations”

Research Group Leader: Mitsuru Neno (National Institutes for Quantum and Radiological Science and Technology)

Visit duration: November 12, 2019 to November 20, 2019

Dr. Manoor Prakash Hande is an Associate Professor at the National University of Singapore. Dr. Hande has been working in the fields of radiation biology, genome stability, telomere biology for the last 30 years. His seminar contribution is in the understanding the role of telomeres in the protection of genome stability and in ageing and cancer. Telomeres are the tips of chromosomes whose dysfunction drives the cells towards chromosome-genomic instability resulting in either ageing and/or cancer. Using mouse models, Dr. Hande and his collaborators have established that telomere-mediated chromosome-genome instability facilitates transformation of cells into cancer. These findings were instrumental in identifying the all-important role of DNA damage response or repair factors in telomere length maintenance to prevent genomic instability and cancer progression. Dr. Hande has developed a mouse model for retrospective biological dosimetry for ionising radiation exposure that has helped identification of a genomic signature in a human population occupationally exposed to plutonium. His laboratory has been working on the multiparametric approach to identify bioindicators of radiation exposures. Such biomarkers are useful in identifying the biological effects of radiation exposure in accidental scenario or occupational exposure to space radiation in astronauts or cosmonauts. In that direction, study of biological effects of heavy ions (such as Fe and C) would be very important.

Dr. Hande conducted collaborative experiments with Dr. Akira Fujimori at the Molecular and Cellular Radiation Biology Team Department of Basic Medical Sciences for Radiation Damages during the following visits:

Visit 1: September 18 to 28, 2018 – Fe ion experiments with normal and DNA repair deficient mice (Atm^{+/+}, Atm^{+/-} and Atm^{-/-} mice)

Visit 2: March 07, 2019 to March 18, 2019 – Fe ion experiments with DNA repair deficient mice (Atm^{+/+}, Atm^{+/-} and Atm^{-/-} mice)

Visit 3: September 11, 2019 to September 22, 2019 – C ion experiments with DNA repair deficient mice (wild type, Scid^{+/-} and Scid^{+/+} mice)

The visit details were provided in the earlier reports. Chromosome aberration and micronuclei analyses are being done for the samples from the above experiments.



Fig.1 : 62nd Annual Meeting of the Japanese Radiation Research Society, Kyoto University, Kyoto, Japan

During this visit, Dr. Hande along with Dr. Fujimori attended the 62nd Annual Meeting of Japanese Radiation Research Society held at Kyoto University, Kyoto, Japan from November 14 to 16, 2019 (Fig 1). Dr. Hande gave an oral presentation on “Biological effects of high LET heavy ions in human blood lymphocytes and mouse cells” in Oral Session 2 DNA damage and carcinogenesis on November 14, 2019. In this presentation, data on C and Fe ion induced molecular and cellular changes including chromosome aberrations and differential gene expression were discussed. Preliminary data on the studies done in September 2018 and February 2019 visit were presented as well (Fig 2).

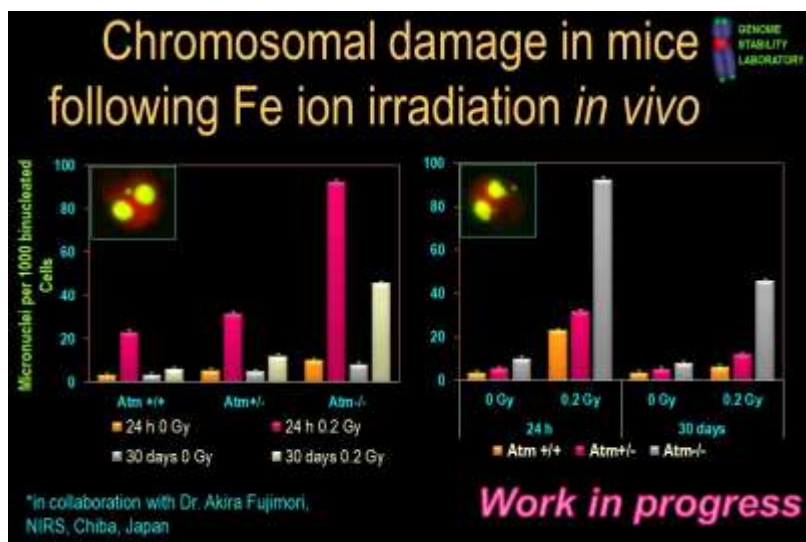


Fig 2: Induction and Persistence of micronuclei induced by Fe ions in mice.

During the meeting, Dr. Hande and Dr. Fujimori discussed various aspects of the collaborative work with Dr. Ryuichi Okayasu, Dr. Merriline Satyamitra (Radiation and Nuclear Countermeasures Program, National Institute Allergy and Infectious Diseases, National Institutes of Health, USA) and Professor Ohtsura Niwa (Radiation Effects Research Foundation, Hiroshima) (Fig 3 a and b).



Fig 3 a. Dr. Okayasu, Dr. Hande and Dr Fujimori



Fig 3b. Dr. Satyamitra, Dr. Hande and Prof. Niwa

Following the meeting in Kyoto, Dr. Hande visited National Institute of Radiological Sciences, Chiba, Japan from November 17 to 20, 2019. Dr. Hande collected the samples from the experiments conducted in February 2019. More discussions on the ongoing collaboration and a visit to Center for Advanced Radiation Emergency Medicine was also planned (Fig 4).



Fig 4. Dr. Hande, Dr. Fujimori, Dr. Satyamitra, Dr. Hideo Tatsuzaki.



Fig 5. Dr. Hande, Prof Yamashita

Dr. Hande discussed with Professor Shunichi Yamashita, Director General, Center for Advanced Radiation Emergency Medicine as well (Fig 5)

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