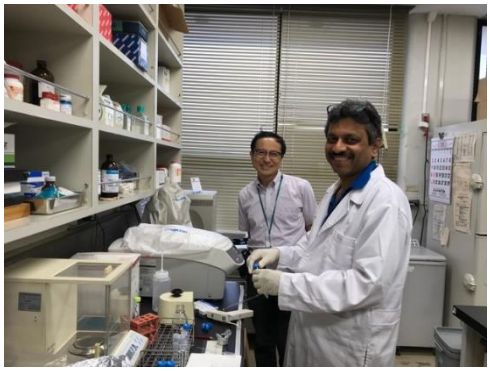
Prof Prakash Hande and Dr. Akira Fujimori collaborate on mouse studies using Fe ions

(A03-1) "Multidisciplinary Analysis of the Effect of Low Fluence Particle Radiation on Animals and Biological Adaptations"
Research Group Leader: Mitsuru Nenoi
Visit duration : 2018 March 7 - 18

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) would be very important.



Dr Hande and Dr Fujimori in Sept 2018 (NIRS)

Dr. Hande during March 2019 visit at NIRS.

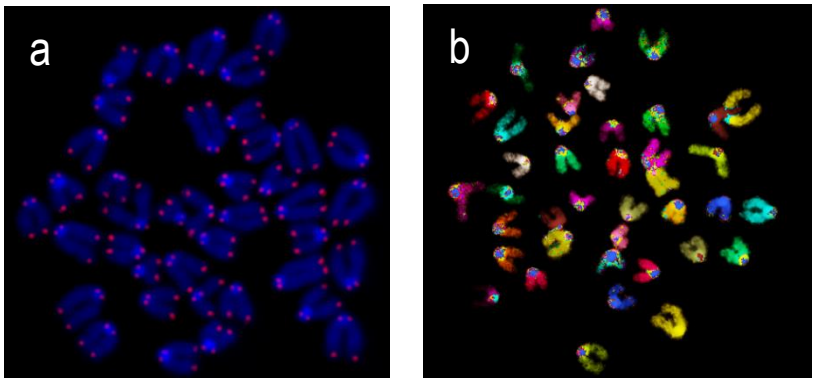
Dr. Hande visited and conducted collaborative experiments with Dr. Akira Fujimori at the Molecular and Cellular Radiation Biology Team Department of Basic Medical Sciences for Radiation Damages from September 18 to 28, 2018. During his work at NIRS, mice from Atm-/- were exposed to different doses of Fe ions. Spleen lymphocytes were isolated from the irradiated and control mice from different genetic background and metaphase chromosomes were prepared to determine the persistent chromosome aberrations (genomic instability) in mice. Multicolour fluorescence in situ hybridissation (mFISH) will be performed to analyse the chromosomal changes (both structural and numerical) and telomere specific PNA-FISH will be conducted to determine the dicentrics and telomere dynamics. These studies will identify persistence of genome instability in vivo in mice as well as highlight the genetic susceptibility of DNA repair deficiency in mice (Dr. Akira Fujimori). Examples of using mFISH and PNA-FISH on mouse chromosomes is illustrated here below.

As part of the second visit, Dr. Hande visited NIRS from March 07, 2019 to March 18, 2019. During this visit, mice from Atm-/- and Atm+/- and Atm+/+ backgrounds were exposed to 0.2 Gy of Fe ions. Spleen lymphocytes were isolated within 24 hours of irradiation and metaphase chromosomes were prepared to determine the chromosome aberrations (dicentrics and translocations) in mice. Multicolour fluorescence

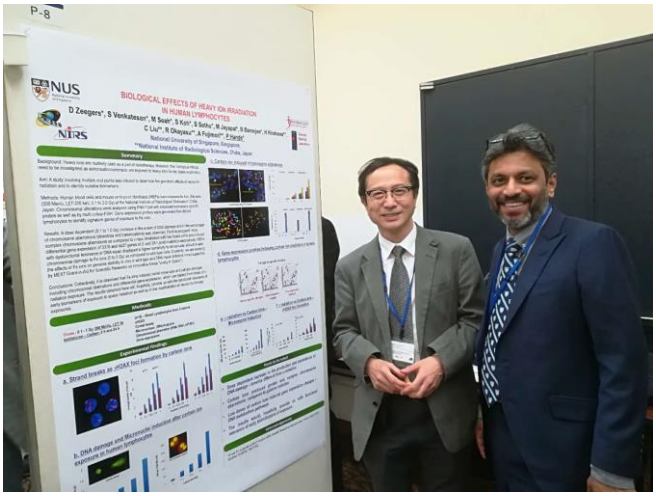
in situ hybridissation (mFISH) will be performed to analyse the chromosomal changes (both structural and numerical) and telomere specific PNA-FISH will be conducted to determine the dicentrics and telomere dynamics. These studies will identify immediate response to Fe ions in vivo in mice and we will be able to compare this data with the data obtained on persistence of genome instability in vivo in mice (experiments conducted in September 2018) as well as highlight the genetic susceptibility of DNA repair deficiency in mice.

Examples of using mFISH and PNA-FISH on mouse chromosomes is illustrated here below.

a) PNA FISH using telomere probe and b) multicolour FISH on mouse metaphase spreads.



On March 15, 2019, Dr. Hande along with Dr. Fujimori attended the “International Symposium on Living in Space 2019” at Kyoto University, Kyoto, Japan. Dr. Hande presented a poster on “Biological Effects of Heavy Ion Irradiation in Human Lymphocytes” on March 16, 2019 in association with the meeting of principal investigators KAKENHI project “Living in Space”. In this poste presentation, data on Fe ion induced molecular and cellular changes including chromosome aberrations and differential gene expression were discussed.



This international exchange is supported by MEXT Grant-in-Aid for Scientific Research on Innovative Areas “Living in Space” (Grant Numbers:15H05935, 15K21745).