# Chair Nuclear Science and Engineering (Research Reactor Institu

## 2.5.15 Laboratory : Radiation Safety Control

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| Member : | Professor | Takahashi, Sentaro, D. Agric. Sci. |
| | Associate Professor | Takahashi, Tomoyuki, D. Eng., Kinashi Yuko, D. Med. |
| | Assistant Professor | Yamasaki, Keizo, M. Eng., Yashima, Hiroshi, D. Eng., Nakamura, Hidehito, D. Sci., |
| | Master's Program | 2 |

**A. Research Activities (2009.4-2010.3)**

**A-1. Main Subjects**

a) Development of efficient and high performance methods for radiation safety control

The overall objective of this laboratory is to develop a new & efficient radiation control system. Research Reactor of Kyoto University (KUR) are used for a variety of research and development as well as education. In this laboratory, efficient and high performance methods for radiation safety control are being developed. This method uses the information related to features of radiation works, knowledge and experience of workers, and their health, medical and psychological conditions. In this year, KUR re-started after the exchange of its fuel, so the investigation on the radiation work using KUR and additional facilities.

b) Characterizations of radio-aerosol produced by the use of accelerator

Recentry the use of accelerator are much increasing in many field of research and industry sites. Radioactive aerosols are generated during the usage of high energy accelerator, but the detail of the mechanisms and characteristics of the aerosols has not been well known. In this study, the physico-chemical characteristics of accelerator related aerosols were investigated in the air irradiated by high energy neutron generated with a linear accelerator.

c) Estimation of the residual radioactivity in the nuclear and accelerator facilities

It is an important issue for radiation safety control to investigate the induction of secondary particles (mainly neutron) and induced-radioactivity in the air, water, and equipments, during the use of nuclear facilities and accelerator facilities. In this study, the experiment on the shielding to high energy neutron and the measurement on nuclide-production cross-sections induced by charged particles and neutrons have been carried out to contribute to the safety assessment of nuclear and accelerator facilities.

d) Behavior and kinetics of radioactive materials in the land ecosystem

In order to assess the effects of radioactive materials originated from nuclear facilities, a development of model to analyze the behavior of radioactive materials in the environment, and the identification of related parameters are essential . In this year, the supportive research and investigations were carried out with relation to the Fukushima Nuclear Power Station Accidents, in adition to the routine research works.

e) Health effects and risks of radiation and radioactive materials

The information on the health effects of radiaton is essential for the reasonable radiation safety contorol. In this year, we investigated DNA damage of culture cells (CHO and xrs5) after exposed to the neutron beams used for boron neutron capture therapy. Some clinical researches were also carried out with collaboration to the clinical group.

**A-2.Publications and presentations**

a) Publications

Original Papers

- Evaluation of the radiosensitivity of the oxygenated tumor cell fractions in quiescent cell populations with solid tumors,
Masunaga S, Nagasawa H, Liu Y, Sakurai Y, Tanaka H, Kashino G, Suzuki M, Kinashi Y, Ono K
Radiation Research, 174, 459-466, 2010.

- Influence of manipulating tumour hypoxia in solid tumors on radiation dose-rate effect in vivo, with reference to that in quiescent cell population,
Masunaga S, Hirayama R, Uzawa A, Kashino G, Tanaka T, Tanaka H, Suzuki M, Kinashi Y, Liu Y, Koike S, Ando K, Ono K
Jpn J Radiol, 28, 132-142, 2010.

- Significance of manipulating tumour hypoxia and radiation dose rate in terms of local tumour response and lung metastatic potential, referring to the response of quiescent cell populations, Masunaga S, Matsumoto Y, Kashino G, Hirayama R, Liu Y, Tanaka H, Sakurai Y, Suzuki M, Suzuki M, Kinashi Y, Maruhashi A, Ono K
The British Journal of Radiology, 83, 776-784, 2010.

- Shielding Experiments at High Energy Accelerators of Fermilab(II)- Spatial distribution measurement of reaction rate behind the shield and its application for Moyer model –
H.Yashima et al.
P Nucl Sci Technol, Vol.1, p.48-51(2011)

b) Conference and seminar papers presented

- 53th annual meeting of Japan Radiation Research Society: 2 presentations

**A-3.Off-campus activities 1**

Membership in academic societies

- akahashi Tomoyuki, Dr. Eng. : Japanese Society of Health Physics (Editorial Board)

**A-3.Off-campus activities 2**

Research grants

1. Grants-in-aid for Scientific Research(KAKENHI)

- Grant-In-Aid for Young Scientist (B) : Yashima Hiroshi : A study on the measurements of nuclide-production cross-sections of high energy neutorons.

**B.Educational Activities(2009.4-2010.3)**

**B-1.On-campus teaching**

a) Courses given

- Undergraduate level : Behavior of Contaminants in the Environment (Takahashi, S. )

- Graduate level : Environmental Radiation Protection (Takahashi, S.),
Seminar in Environmental Radiation Control I, II (Takahashi, S., Takahashi T.),
Applied Environmental Radiation Technology (Takahashi, S.),
Experimental Radiation Control in the Environment (Takahashi, S.Takahashi, T., Yamasaki, K., Yashima, H.)

**B-2.Off-campus teaching etc.**

Part-time lecturer

- Sentaro Takahashi: Osaka University, Medical College, Foundamental Radiology

**C.Other Remarks**

- Takahashi S.: Osaka Prefecture (Environmental Radiation Assessment Committee), , Kyoto Prefecture (Emvironmental Radiation Mesurement Committee)

- Takahashi, T.: Japan Atomic Energy Agency (TRU/Uraniumu Waste Disporsal Committee), , Institute for Environmental Sciences (Plant Carbon Transfer Committee),, Nuclear Safety Technology Center (Monitoring Text Sub-groupe Committee)