Hiroshima University

The 3rd International Symposium

Phoenix Leader Education Program (Hiroshima Initiative) for Renaissance from Radiation Disaster

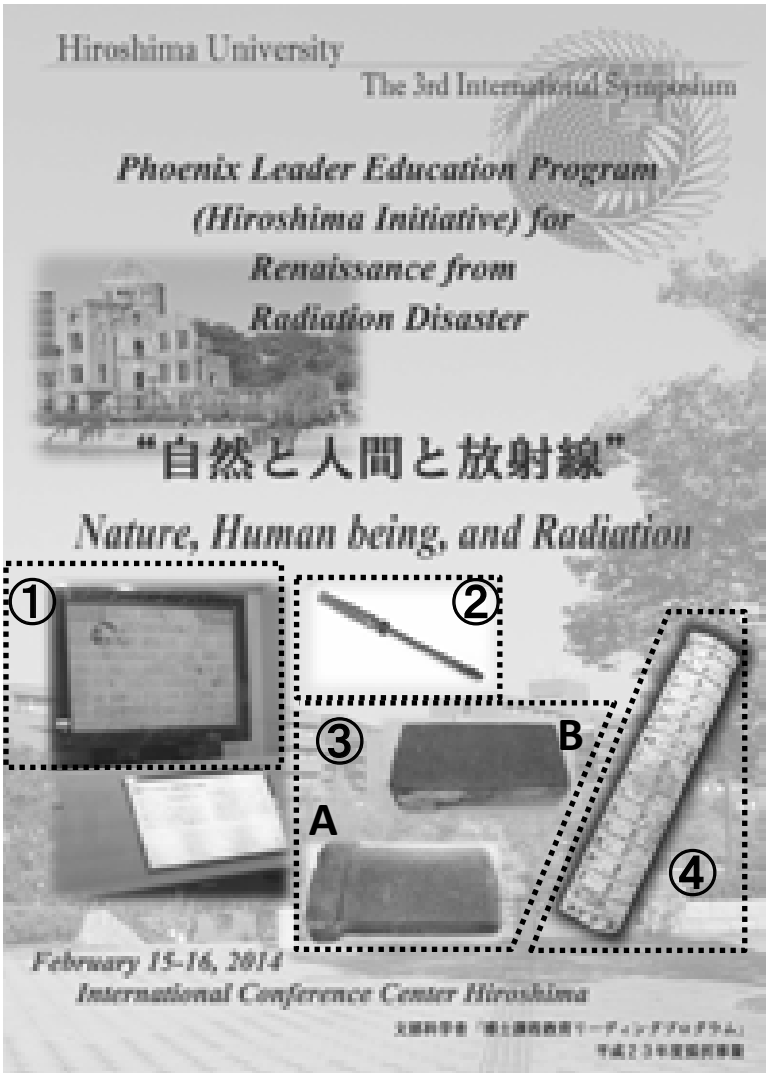
“自然と人間と放射線”

Nature, Human being, and Radiation

February 15-16, 2014

International Conference Center Hiroshima

文部科学省「博士課程教育リーディングプログラム」
平成２３年度採択事業



①Burnt tile
It was collected from Hiroshima University of Literature and Science (predecessor of the present Hiroshima University) which was burned down by the atomic bombing.
The bloodstain is telling the tragedy of the atomic bombing.
被爆タイル
原子爆弾により焼失した広島文理大学（広島大学前身校の）から保存された。
生々しい血痕が原子爆弾の悲惨さを物語る。

②Screw driver which was exposed to radiation
It was collected from Hiroshima University of Literature and Science (predecessor of the present Hiroshima University) which was burned down by the atomic bombing. It was taken over to Professor Tamotsu Toshima of Hiroshima University Graduate School of Education Psychology Laboratory.
Donated by Professor of Special Appointment Tamotsu Toshima (owned by Hiroshima University Museum)
被爆ドライバー
原子爆弾により焼失した広島文理大学（広島大学前身校の）から保存された。
後に広島大学教育学研究科心理学研究室の利島保教授に引き継がれた。
利島　保　特任教授　寄贈（広島大学総合博物館所蔵）

③A roof tile (A) and a brick (B) which were exposed to radiation
Collected and preserved from the epicenter of atomic bomb explosion soon after the bombing. It shows the surface dissolved and bubbled by heat rays of high temperature. Donated by Professor of Special Appointment Kiyoshi Shizuma(owned by Hiroshima University Museum)
被爆瓦（A）、被爆レンガ（B）
原子爆弾爆心直下から被爆後間もなく収集保存された。
超高温の熱線により表面が溶解し泡立った様子がわかる。
靜間　清　特任教授　寄贈（広島大学総合博物館所蔵）

④Core sample of granite from a pillar of Motoyasu bridge in Hiroshima city.Sampled to monitor the radiation from the atomic bombing
Donated by Professor of Special Appointment Kiyoshi Shizuma(owned by Hiroshima University Museum)
広島市内にある元安橋柱の花崗岩コアサンプル
原子爆弾による放射線測定のために採取された。
靜間清特任教授寄贈（広島大学総合博物館）

フェニックスリーダー育成プログラム

第３回国際シンポジウム

「自然と人間と放射線」

広島大学長　浅原利正

放射線災害復興を推進するフェニックスリーダー育成プログラム第 3 回国際シンポジウム「自然と人間と放射線」を昨日と今日の 2 日間開催し，2 日目の今日は，国内外から招聘した専門家の方々に講演していただきます。

放射線と聞くと原子力発電所事故に関わる放射線災害が連想されますが，自然界や宇宙にも存在しており，医療分野での診断・治療への活用など，放射線は私たち人間にとって身近な存在ともいえます。このような放射線に一般の参加者の皆さんにも関心を持っていただけるよう，今回は特別講演としてNHK解説委員室の水野倫之様に講演をお願いいたしました。またサイエンス、テクノロジーと社会がどのように関わっていくのかという点について、国内外の先生方にご講演いただきますので、ご期待ください。

本プログラムは，文部科学省「博士課程教育リーディングプログラム」に平成 23 年度採択され，平成 24 年 10 月からプログラムを開始しています。昨年 10 月には第 2 期生 11 人を迎え，第 1 期生 8 名と合わせて 19 名の様々な国籍と背景をもつ大学院生が，放射線災害に適切に対応し復興を指導できるグローバルリーダーとなるため日々励んでいます。シンポジウム 1 日目の昨日はプログラムに所属する大学院生の研究・学習活動に関する発表と，プログラム担当者の研究室に所属する学生のポスター発表を開催いたしました。

本シンポジウムを通して，放射線に対する専門家の知見が多くの皆様に共有され， またフェニックスリーダー育成プログラムへの関心と理解が高まることを願っております。

Phoenix Leader Education Program
The 3rd International Symposium
"Nature, Human being, and Radiation"

Toshimasa Asahara
President of Hiroshima University

It is my great pleasure to announce the opening of the second day of the 3rd International Symposium of Phoenix Leader Education Program (Hiroshima Initiative) for Renaissance from Radiation Disaster, titled "Nature, Human being, and Radiation" with distinguished speakers invited from Japan and abroad .

The word 'radiation' may remind one of a radiation disaster related to the memory of the nuclear power plant accident in Fukushima in 2011. On the other hand, radiation exists in the natural environment and the universe, and it is common and useful in our daily life because of its practical application such as in diagnosis and treatment in the medical field. Today we have invited Mr. Noriyuki Mizuno from NHK as a speaker of a special lecture, which may help the general audience to become more aware of radiation. Researchers who are specialized in fields of medicine and STS are invited to discuss how science and technology should concern the society.

Phoenix Leader Education Program was adopted as part of FY2011 Program for Leading Graduate Schools of the Ministry of Education, Culture, Sports, Science and Technology, and started in October 2012 with eight students. Last October, 11 students joined and total 19 of various nationalities and background are working hard every day. They are expected to obtain specialist knowledge and skills required to become global leaders who can supervise appropriate action and recovery process in the event of radiation disaster. In order to report the outcome of their learning activities, the program students made presentations yesterday as part of the symposium. Many other students who belong to the laboratories of the program members also joined in the presentation of the posters. .

I hope this symposium will offer a useful opportunity for you to learn the latest findings in the field as well as enhance your interest and the understanding of the Phoenix Leader Education Program.

Contents

General Information

Date

February 15-16, 2014

Venue

International Conference Center Hiroshima

1-5 Nakajima-cho, Naka-ku, Hiroshima 730-0811 Japan

Phone: +81-82-242-7777 Fax: +81-82-242-8010

Language

English and Japanese

Organized by

Organization of the Leading Graduate Education Program

放射線災害復興を推進する

フェニックスリーダー育成プログラム

放射線災害による人と社会と環境の破綻からの復興を担う
グローバル人材養成

本プログラムでは、原爆からの復興を支えた広島大学の実績と経験を生かして、分野横断的・実践的学問領域である「放射線災害復興学」を確立し、放射線災害からの復興の核となる「放射線災害から生命を護る人材」、「放射能から環境を護る人材」、「放射能から子どもと社会を護る人材」を育成します。5 年もしくは 4 年一貫の徹底した人材育成カリキュラムにより、放射線災害に適切に対応し、明確な理念の下で復興に貢献できる判断力と行動力を有した、国際的に活躍できる分野横断的統合的グローバルリーダー（フェニックスリーダー）を輩出します。

（文部科学省「博士課程教育リーディングプログラム」 平成 23 年度採択プログラム）

Phoenix Leader Education Program (Hiroshima Initiative) for Renaissance from Radiation Disaster

Develop global human resources who are expert in the recovery
of people, society and the environment
from damage caused by radiation disaster

This program establishes "Radiation Hazard Recovery Studies" as an interdisciplinary and practical discipline based on Hiroshima University's experience and achievements in supporting recovery from the atomic bomb. The program will develop personnel with the skills to "protect human lives from radiation hazards," "protect the environment from radioactivity," and "protect children and society from radioactivity." Graduates from the program will become core leaders in situations requiring recovery from radiation hazards.

The 5-year or 4-year integrated curriculum is designated to develop interdisciplinary and comprehensive global leaders (Phoenix Leaders) who can act appropriately in circumstances of radiation hazards, and who can contribute to the recovery with leadership based on a clear philosophy.

(Ministry of Education, Culture, Sports, Science and Technology – MEXT
"Program for Leading Graduate Schools" accepted for FY2011

Program

The 3rd International Symposium on
Phoenix Leader Education program (Hiroshima Initiative) for
Renaissance from Radiation Disaster

"Nature, Human being, and Radiation"

February 15-16, 2014
International Conference Center Hiroshima

February 15, 2014

12:30- Registration

Room: Dahlia 1

13:00-13:15 Opening Ceremony
13:15-14-30 Graduate Student Presentation I
14:30-14:40 Break
14:40-15:45 Graduate Student Presentation II and III
15:45-16:00 Break

Room: Dahlia 2

16:00-18:00 Poster Session

Room: Dahlia 1

18:30-20:30 Reception

February 16, 2014

Room: Himawari

9:15- Registration

9:45-10:00 Opening Ceremony

10:00-10-40 **Special Lecture**

Noriyuki Mizuno（NHK Science Commentator）

"Nuclear power plant disaster and direction of nuclear energy policy"

10:40-11:20 **Lecture I**

Dr. Jacques Lochard (Chairman of Committee 4, ICRP)

"Ethical Aspects of Radiological Protection"

11:20-12:00 **Lecture II**

Dr. Tom K. Hei（Professor, Columbia University）

"The New Radiobiology: Extracellular and Extranuclear Effects of Ionizing Radiation"

12:00-13:00 Break

（12:00-12:10 Ceremonial Photograph）

13:00-13:40 **Lecture III**

Dr. Richard Hindmarsh（Associate Professor, Griffith University）

"Nuclear Risk Governance Post-Fukushima Daiichi: Policy Learning to Reduce Radiation Risk"

13:40-14:20 **Lecture IV**

Dr. Yuko Fujigaki（Professor, University of Tokyo）

"What STS can do for bridging between experts and public in Radiation Disaster?"

14:20-14:40　Break

14:40-15:20　**Lecture V**

Dr. Gregory Clancey

（Associate Professor,　National University of Singapore）

"Reflections on disaster in the early 21st century"

15:20-16:00　**Lecture VI**

Dr. Rethy K. Chhem（Director, Human Health, IAEA）

"Understanding and addressing nuclear accident through STS approach"

16:00-16:30　Award Ceremony, Closing Ceremony

Abstracts

Lectures

February 16, 2014
9:45~16:30

International Conference Center
Hiroshima
Room: Himawari

1　Special Lecture

原発事故と原子力政策のゆくえ

水野　倫之

（NHK 解説委員）

間もなく事故から 3 年になるが現場では汚染水の海への流出が止まらない深刻な事態が続いており、今年は抜本対策に道筋がつけられるかが問われる 1 年になる。

一方で安倍政権は原発再稼働を進めようとしているが、原発の安全対策だけでなく各地の防災計画、それに核のゴミの処分問題など解決しなければならない問題が山積となっている。

Nuclear power plant disaster and direction of nuclear energy policy

Almost three years have passed since the accident at Fukushima Daiichi nuclear plant. But the outflow of contaminated water from the accident site into the sea continues.
Attention is now focused on whether comprehensive measures could be taken.
The Abe Administration seeks to re-start the idle nuclear power plant.

However, many issues have yet to be resolved, not only　the safety measures of nuclear power plants, but also the disaster　prevention plans of local municipalities, and the disposal of　radioactive waste.

【プロフィール】水野　倫之（ＮＨＫ解説委員）

ＮＨＫに記者として入局後、青森で核燃料サイクル施設を取材したのをきっかけに原子力の担当となる。もんじゅのナトリウム漏れや東海村の臨界事故など事故取材も多く経験。科学技術担当の解説委員となってからも原子力の取材を進め、福島第一原発事故では発生直後からニュースなどで事故の状況を数か月にわたって解説した。
原子力以外にも宇宙開発や天文、環境問題等を担当する。

著書に「日本一わかりやすいエネルギー問題の教科書」「緊急解説！福島第一原発事故と放射線」（共著）がある。

Lecture I

Ethical Aspects of Radiological Protection

Jacques Lochard

Nuclear Protection Evaluation Centre (CEPN)
Fontenay-aux-Roses, France

The system of radiological protection is based on three pillars: science, ethical and social values, and experience. As far as ethics is concerned the fundamental principles structuring the system (justification, optimisation and limitation) combines values that are at the heart of the three major theories of moral philosophy: respect for the rights of the individual (which falls within deontological ethics), the pursuit of collective interest (which falls within utilitarian ethics), and the promotion of vigilance and fairness (which falls within the ethics of virtue).

Two key values underlie the radiation protection system: prudence and justice. Prudence (in modern terms 'precautionary principle') is the cornerstone of the system that allows taking into account uncertainties concerning both deterministic and stochastic effects of radiation on health. Prudence has a very long and universal ethical tradition in Western countries, but also in the Buddhist and Confucianism traditions as well as the ancient people of Oceania and America. Justice is the way to ensure social equity and fairness in decisions related to protection within the present generation, but also with respect to future generations (intergenerational equity). This promotion of social justice and equity is mainly undertaken in practice by introducing restrictions on individual exposures in the system of radiological protection.

Over the past decade the system has also integrated procedural values such as, stakeholder involvement, right to know, informed consent and self-help protection, reflecting the importance to properly inform and also preserve the autonomy and dignity of persons potentially or actually exposed to radiation.

More recently the human dimension of the Fukushima accident has clearly

highlighted the importance of relying on the ethical values that underpin the system to implement in a respectful manner the protection of persons in the affected territories.

【Profile】Jacques Lochard　(Director, Nuclear Protection Evaluation Centre (CEPN))

His main contribution in radiation protection has been in the development of methodologies and implementation tools in the field of optimisation of radiological protection. He has written several tens of articles in scientific journals and proceedings of international conferences, covering both the theoretical and practical aspects of optimisation.

From 1990 to 2010, he was involved in international projects on the consequences of the Chernobyl catastrophe and the rehabilitation of living conditions in the contaminated territories in Belarus. He chaired the Commission on long term of the French Steering Committee for the management of the post-accident phase of a nuclear accident or a radiological emergency (CODIRPA) from 2009 to 2012. He is currently involved in several activities in Japan in relation to the Fukushima accident.

Jacques LOCHARD has been President of the French Society of Radiation Protection (1997-1999), Chairman of the Committee on Radiation Protection and Public Health of the Nuclear Energy Agency of the OECD (2005-2009) and Executive Officer of the International Radiation Protection Association (2000-2012). He is currently Vice-Chair of the International Commission on Radiological Protection.

Lecture II

The New Radiobiology: Extracellular and Extranuclear Effects of Ionizing Radiation

Tom K. Hei

Center for Radiological Research, Department of Radiation Oncology,

Columbia University Medical Center, New York, NY.,10032 USA

Although radiation is a well established human carcinogen, it is an important modality in the clinical management of cancer where some 60% of patients are treated with radiation either as a single agent or in combination with other treatments. In this regard, and on a mechanistic basis, generations of students in radiological sciences have been taught that the quintessential target for radiation induced cell death and genetic damages resides in the DNA of the nucleus. Using a charged particle microbeam, there is evidence that targeted cytoplasmic irradiation results in mutations in the nuclei of the same hit cells through a process involving reactive oxygen species. In addition, cells that are not traversed by an alpha particle can participate in the damage process involving gap junctional proteins and cell surface ligands. Radiation-induced extranuclear/ extracellular effects thus represent a paradigm shift in our understanding of the relevant target(s) of ionizing radiation.

Targeted cytoplasmic irradiation induces changes in mitochondrial morphology. Since mitochondria are the energy center of a cell, their biogenesis and function have major implication on the disease process in an organism. Normal mitochondria are highly dynamic organelles that move along microtubules or microfilaments and continuously fuse and divide in healthy cells. A balance between mitochondrial fusion and fission is

essential to maintain normal mitochondrial function. In contrast, irradiated cells show shortened and fragmented mitochondria together with a reduction in mitochondrial functions. These included reduced cytochrome C-oxidase as well as succinate dehydrogenase activities when compared with non-irradiated controls, suggestive of reduced respiratory metabolism. Furthermore, irradiated airway epithelial cells showed an increase in mitochondrial superoxide production that was quenched by the radical scavenger, dimethyl sulfoxide. This acute mitochondrial response caused by cytoplasmic irradiation may result in the release of several stress mediators, which are necessary for mitochondria to preserve cellular homeostasis.

In addition, irradiation of lower halves of mice with a 5 Gy dose of X-rays resulted in the induction of mutation and cyclooxygenase-2 (COX-2) in out of field lung and breast tissues. This abscopal or out of field phenomenon would imply that non-targeted effects coordinate in a complex interplay involving organs, tissues and cells. Although radiation induced non-targeted effects have been well documented in a variety of *in vitro* and *in vivo* endpoints, the mechanism is not known. There is recent evidence that the NF-κB-dependent gene expression of interleukin 8, interleukin 6, tumor necrosis factor and interleukin 33 in directly irradiated cells produced the cytokines and prostaglandin E2 are involved in the signaling process. The observations that heritable DNA alterations can be propagated to cells many generations after radiation exposure and that bystander cells exhibit genomic instability in ways similar to directly hit cells indicate potential long term effects of the non-targeted response. A better understanding of the mechanism of the non-targeted effects will be invaluable to assess the clinical relevance of the bystander effects and ways in which the bystander phenomenon can be manipulated to increase therapeutic gain in radiotherapy.

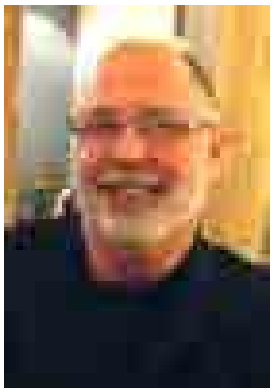
【Profile】Tom K. Hei (Professor and Vice-chairman of Radiation Oncology and Associate Director of the Center for Radiological Research, Columbia University Medical Center.)

Dr. Tom K. Hei received his B.Sc. (Summa Cum Laude) from the University of Wisconsin-Whitewater and his Ph.D. in experimental pathology from Case Western Reserve University. He has been on the faculty of Columbia University since 1983 and currently holds a joint appointment as professor of environmental health sciences in the Mailman School of Public Health. Dr. Hei's research focuses on basic mechanisms of radiation and environmental cancer. Using a charged particle microbeam, his laboratory demonstrates unequivocally that radiation induces both extranuclear as well as extracellular effects that set off a paradigm shift in our understanding of the new radiobiology. Dr. Hei was a panel member of the United States Institute of Medicine in reviewing the NIOSH Roadmap for Research on Mineral Fibers. He serves in several NIH advisory panels. Dr. Hei was elected Educator of the Year by the Association of Residents in Radiation Oncology in 2012. He is the immediate past president of the Radiation Research Society and has many years of experience in mentoring doctoral, medical, clinical radiation oncology residents and postdoctoral research fellows, many of whom are now leaders in their own field around the world. For more information, please check out his complete curriculum vitae in his laboratory website:

http://www.crr.columbia.edu/hei.htm

Lecture III

Nuclear Risk Governance Post-Fukushima Daiichi: Policy Learning to Reduce Radiation Risk



Richard Hindmarsh

Griffith School of Environment and Centre for Governance and Public Policy, Griffith University, Brisbane, Australia

Introduction: Post-Fukushima radiation risk context

Post-Chernobyl, an important insight for policy learning[1] was that nuclear risks 'open up the scope for innovative approaches to risk governance ….[2] One proposal was the integration of expert and lay knowledges to enhance policy legitimacy and competency in regard to technology choices and the management of their risks.[3] The Fukushima disaster—with numerous implications for nuclear energy safety, siting, radiation risk, and risk communication and management in contemporary contexts of good governance—strengthened this proposition dramatically.[4] Radiation risk attracted high citizen distrust of government,[5] marked loss of support for nuclear power, and broad international concern.[6]

To suggest policy learning innovations to reduce radiation risk, I provide understandings from relevant studies including those from my recent volume on the disaster, with a focus on social aspects.[7] As Oughton and Howard emphasised, 'although in recent years authorities have acknowledged the importance of social aspects in the assessment of radiation risks ... none of the resulting policy recommendations have been challenged by an accident of the calibre of Fukushima'.[8]

Key social implications post-Fukushima for future radiation risk management relate to ineffective evacuation and risk communication about the extent and impact of the leak of radioactive materials beyond the vicinity of the plant. High use of civic social media immediately resulted as citizens networked to try and work out the answers in the absence of reliable, prompt and coherent official data.[9] This 'citizen science' phenomenon clearly reflected dysfunctionality and breakdown of the nuclear power 'socio-technological system'.[10] The Fukushima experience was the most potent breakdown in the history of nuclear power development in Japan. Priority given to technically-informed decision-making had downplayed the importance of the social aspects or infrastructure of the system in regard to the public and host communities of nuclear power plants.[11] Inadequate public involvement occurred in energy technology choices; safety planning including siting,[12] and in emergency responses and radiation risk preparation, as evidenced by significant psychological trauma post-disaster.[13]

Dysfunctionality was made more potent when we also understand nuclear power as a 'megatechnology'. In certain circumstances such as significant policy failure, megatechnologies begin to feature uncertain and unpredictable multiple complex interactions that could not be previously tested in

laboratories or through computer simulations.[14] 'Rather, their unanticipated consequences can only be discovered after they are implemented'.[15] In environmental management, when such circumstances occur repeatedly they represent a 'wicked' problem; one that keeps reappearing unless addressed *comprehensively*.[16] As such, the resolution of wicked problems relies significantly on 'the collective judgment of stakeholders involved in a process that is experiential, interactive and deliberative', as a governability issue.[17] Missing in Japan, and reportedly, elsewhere,[18] such resolution is important to create adequate functionality of nuclear power socio-technological systems as tightly coupled and coproduced, and thus, arguably, to reduce radiation risk.[19]

'Recoupling' the nuclear power socio-technological system

To create adequate functionality in practice is for nuclear risk governance to follow broader international policy shifts to become more socio-technically oriented, which seems apt in *both pre and post*-disaster contexts through broad stakeholder participation. Currently, the literature reveals that suggestions for most remedial actions post-Fukushima focus on strengthening the *post-disaster* terrain of radiation risk through expert approaches.[20] However, a key recoupling strategy in a wide range of fields is collaborative/dialogic engagement across scientist/non-scientist boundaries, particularly in controversial science and technology and environmental areas,[21] with science policy increasingly supportive.[22] Important benefits see greater legitimacy and competent policy result and public trust rebuilt.[23] Such engagement would work in well with the emergent area of developing *psychological preparedness* for disaster management. Psychological preparedness enables citizens to better emotionally confront a disaster and traverse the physical symptoms a person might experience, and then focus more on situational survival mechanisms.[24]

In public health, an innovative community engagement approach for emergency preparedness and response was the recent Los Angeles County Community Disaster Resilience Initiative.[25] It encompasses individual preparedness as well as establishing a supportive social context in communities to withstand and recover from disasters, which includes building psychological resilience.[26] This pre-disaster focus complements interventions post-disaster, including psychological first aid, family outreach, psychoeducation, and social support, screening, and anxiety reduction techniques.[27] Yet another suggestion is the development of social media as a complementary risk communication tool. Post-Fukushima, smart phones offered resilient communication tools when electricity became unavailable.[28] Online civic radiation monitoring maps proved useful when official radiation monitoring communication breakdown occurred.[29] Citizen radiation monitoring of local neighbourhoods through DIY Geiger counters proved useful in regard to hot spots.[30] Another study canvassed that tweets offer potential to track public anxiety as an early warning system.[31] Governmental efforts to use social media to improve appropriate responses to emergencies by building social connectivity and emergency kits are also now emerging to prepare community resilience.[32]

Conclusion

Policy learning for innovative capacity building for integrated pre- and post-disaster socio-technical planning approaches points to inclusive,[33] or anticipatory,[34] nuclear risk governance approaches. The Los Angeles County Community Disaster Resilience initiative provides one model. Affected and experienced publics are now widely available across Japan to better develop collaboratively, community resilience in regard to nuclear disasters and reducing radiation risk.

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2 O'Connor, M. and van den Hove, S. (2001) Prospects for public participation on nuclear risks and policy options: innovations in governance practices for sustainable development in the European Union. Journal of Hazardous Materials 86: 77-99.

3 On legitimacy and policy competence, see: Fung, A., Wright, E. (2003) Deepening democracy: institutional innovations in empowered participatory governance. Verso: London; Peter, F. (2008) Democratic legitimacy. Routledge: UK.

4 An apt international understanding of good governance is informed by principles of openness, participation, accountability, effectiveness and coherence (Commission of the European Communities (2001). European Governance: A White Paper. Com (2001): 428. Brussels: CEC).

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6 For example: Friedman, S. (2012) Three Mile Island, Chernobyl, and Fukushima: an analysis of traditional and new media coverage of nuclear accidents and radiation. Bulletin of the Atomic Scientists 67(5): 55-65; Oughton, D. and Howard, B. (2012) The social and ethical challenges of radiation risk and risk management. Ethics, Policy and Environment 15(1): 71-76.

7 Hindmarsh, R. (ed.) Nuclear disaster at Fukushima Daiichi: social, political and environmental Issues. Routledge: New York.

8 Oughton, D. and Howard, B. (2012) The social and ethical challenges of radiation risk and risk management. Ethics, Policy and Environment 15(1): 71-76. In regard to radiation risk and societal costs see, Westerdahl, K. (2013) Societal consequences of radioactive releases in March 2011 in Japan and implications for the resilience concept. Journal of Risk research DOI: 10.1080/13669877.2013.841732

9 Nature. (2012) Lessons of a triple disaster. Nature 483 (March 8): 123.

10 On socio-technological systems, dysfunctionality and breakdown see: Starr, S. (1999) The ethnography of infrastructure. American Behavioral Scientist 43(3): 377-391.

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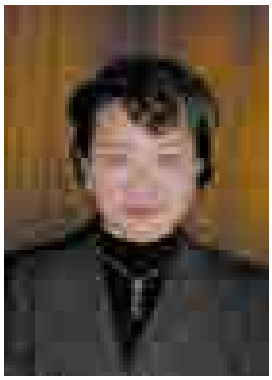
【Profile】Richard Hindmarsh (Griffith School of Environment, and Centre for Governance and Public Policy, Griffith University, Brisbane, Australia)

Richard Hindmarsh (PhD in STS, Griffith University) is Associate Professor at Griffith School of Environment and Centre for Governance and Public Policy, Griffith University, Brisbane, Australia. His field is Environmental Politics and Policy, and Science, Technology and Society (STS). He was cofounder in 2008, and lead Convenor until 2012, of the Asia-Pacific Science, Technology and Society Network [http://apstsn.org/]. The Network focuses on cross-country regional STS issues of governance, citizenship and public policy with regard to important issues raised by new or controversial science and technology, particularly in regard to environmental sustainability and social implications. Journals published in include *Environmental Politics, Local Environment, Nature, Social Studies of Science, Science as Culture, and East Asian Science, Technology, and Society.* His seven books include *Edging towards BioUtopia* (University of Western Australia Press, 2008); *Genetic Suspects: Global Governance of Forensic DNA Profiling and Databasing* (Cambridge University Press, UK, 2010, coedited with Barbara Prainsack); and *Nuclear Disaster at Fukushima Daiichi: Social, Political and Environmental Issues* (Routledge Studies in Science, Technology and Society, New York, 2013). Current research topics include the environmental release of genetically modified crops, wind and nuclear energy, ecopolitical new and social media, participatory governance and sustainability transitions.
[University
blog: http://www.griffith.edu.au/business-government/centre-governance-public-policy/staff/associate-professor-richard-hindmarsh]

Lecture IV



What STS can do for bridging between experts and public in Radiation Disaster?

Yuko Fujigaki, Ph.D.

Graduate School of Arts and Sciences, University of Tokyo, 3-8-1, Komaba, Meguro, Tokyo, 153-8902, Japan

For Radiation Disaster, STS (Science and Technology Studies; Science, Technology and Society) can provide disaster analysis, historical analysis, communication analysis, as well as discussion on governance of technology and public engagement. In Post-Fukushima situation, communication under uncertainty is strongly desired and medical professionals are facing important tasks to reconstruct the trust and to gather health data for residents as well as for the worlds. In this situation, to bridge relevant institutions and to link the validation boundaries of different disciplines, STS(Science and Technology Studies) is expected to do the "bridge-work", not the "boundary-work." In addition, it also expected STS to do "bridge-work" between scientists and public.

In "communication gap" between scientists and citizens, we can compare the deficit model and two-way communication model. In addition, Sakura(2013) pointed out the needs for "double- interpreter" model based on his interview surveys for residents near Fukushima Dai-ichi Nuclear power plants. We also can learn from the concepts of "information transmitter" and "information-interpreter." Scientists and medical professionals tried to convey "right information," and to be a good "information transmitter"; however, public had a strong need for "information-interpreter." What is the difference between "information-transmitter" and "information-interpreter"? Scientists have a desire to be a right "information-transmitter," and they think that to be a good transmitter is one of the responsibilities of scientists. On the contrary, public needs a "information-interpreter" and they asked scientists "What would you do if you were me"? It is very difficult question whether answering this question and being an "information-interpreter" is one of responsibility of scientists or not. There are huge gap between what scientists think as their responsibility and what public think scientists' responsibility. Since medical doctors and scientists have been educated to be a "information-transmitter", they face many troubles in risk communication.

Felt (2013) indicated that for radiation disaster, there are three kind of expertise: Intellectual – expertise, Contributory-expertise, and Adaptive expertise. For building the trust between experts and public, analysis on the difference of "framing" is important. Collaboration on re-framing will play a role

for two-way communication. Re-framing and re-thinking is the core concept in STS, which bring us "self-reflexivity.

【Plofile】Yuko Fujigaki（Graduate School of Arts and Sciences, University of Tokyo, JAPAN）

Educational Background:
1987 M.D. University of Tokyo
1990 Ph.D. University of Tokyo

Major Professional Experiences:
Assistant Professor, University of Tokyo,1990-1996
Vice Director in Research, National Institute of Science and Technology Policy,1996-2000
Associate Professor, University of Tokyo, 2000-2009
Professor, University of Tokyo, 2010-

Major Publications:
Fujigaki, Y. Filling the Gap between the Discussion on Science and Scientist's Everyday's Activities: Applying the Autopoiesis System Theory to Scientific Knowledge, *Social Science Information*, 37(1), 5-22, 1998
Fujigaki, Y , *The Public Ethic and Spirit of Specialism*(in Japanese), Univ.of Tokyo Press, 2002
Fujigaki, Y (editor) *Case Analysis and Theoretical Concepts for Science and Technology Studies* (in Japanese)Univ. of Tokyo Press, 2005
Fujigaki,Y.,Changes in the research stream by standardization: A content analysis of the Archives of General Psychiatry during the establishment of operational diagnostic criteria, *Scientometrics*, 68(2), 203-212, 2006.
Fujigaki, Y. STS in Japan and East Asis: Governence of Scoence and Technology and Public Engagement, East Asisn STS International Journal,2009: 3:511-518.
Yuko Fujigaki and Togo Tsukahara, STS Implications of Japan's 3/11 Crisis, *East Asian Science, Technology and Society: an International Journal*, **5**(3), 381-394, 2011.

Activities in Academic Societies;
Council, Japanese Society for Science and Technology Studies (2001-)
Council, International Society for Social Studies of Science (2002-2005)
Program Chair, Annual Meeting of International Society for Social Studies of Science 2010 in Tokyo

Governmental Activities;
Council Member for Science Technology, and Research Policy, Ministry of Education, Science, Technology, Culture and Sports(2013-)
Policy Evaluation Committee, Ministry of Education, Science, Technology, Culture and Sports(2001-2003)
Evaluation Committee for Research Institutes, METI(2002-2005)
Advisory Committee of Examination for First-class Civil, National Personal Authority(2002-2005)

Lecture V

REFLECTIONS ON DISASTER IN THE EARLY 21st CENTURY

Gregory Clancey

Science, Technology, and Society (STS) Cluster, Asia Research Institute (ARI)
National University of Singapore, Republic of Singapore

The 21st Century is unusually disaster-conscious. The 19th and 20th centuries were arguably less-so, if one eliminates the "disaster" of war. Indeed, the amount of academic literature on natural disasters and large-scale accidents published since the turn of the millennium dwarfs the output of the previous century. At the same time, 'disaster studies', formerly a minor and peculiar inter-disciplinary field, now has manifestations across nearly every academic discipline and at hundreds of the world's universities. Why is this so?

A commonly-advanced explanation is that the numbers, impact, cost, and even severity of natural disaster is increasing. This argument has been advanced by no less an authority than the Secretary-General of the United Nations, and in more precise terms in the studies of globally-active re-insurance firms (which insure insurers). While these arguments normally chart and cite 'events', they are also informed by the ever-stronger discourse on the process of climate change. More precisely, they accompany a growing global worry that climate change is partly manifesting in the acceleration and severity of 'normal' natural disasters, paralleling more abnormal phenomena such as the melting of the polar ice caps. The continued growth of megacities and their ever-extending infrastructures (such as the Fukushima TEPCO plant) in locations prone to natural catastrophe, particularly in Asia, has put the issue on the agenda of urban studies and urban planning.

Whereas "natural disasters" on the one hand, and man-made "accidents" (and deliberate acts of war) on the other were previously treated as distinct categories, they have begun to collapse into one another in the 21st Century. The ambiguities and peculiar mechanisms surrounding climate change have been a major contributing factor – for the first time in human history, hurricanes and severe blizzards are suspected of having artificial origins. Coincidentally (perhaps) two of the largest and most destructive tsunamis in modern history

have occurred in a short time-span, and, uniquely, have been digitally broadcast in their full fury to the world. One of them has triggered a nuclear plant meltdown, leading to the coinage of a new term, "compound disaster".

The phenomenon of "compound disaster", or the collapse of the natural and man-made, has moreover occurred against the political backdrop of a near-global 'war on terror', which has unleashed vivid scenes of urban destruction in parallel to those created accidentally, or by nature, or both. This last reality has as much to do with the rise of 'disaster studies' (or its close relatives 'crisis studies', 'disaster management', 'emergency management' etc.) as the factors discussed above. As governments fund 'emergency management' agencies, programmes, and training courses to deal with terrorist incidents, their 'dual use' in cases of natural disasters/accidents become obvious. In that sense, the term 'emergency', which arose in the 20th century precisely because of its ability to encompass acts of man and nature, expands further to cover ever-increasing areas of preparedness, governance, and response.

My talk will take these convergences as a starting point, and expand the discussion into lessons from the field of Science and Technology Studies (STS) on the 'normalization of accidents/disasters', and the choices we have in thinking about cause and effect. I'll also discuss the 'crisis of expertise' which follows from these multiple convergences, including issues around 'science communication'. I'll consider radiation and the threat of radiation-related disasters/incidents as central examples, but also in comparison to other types of related phenomena.

【Plofile】Gregory Clancey (Science, Technology, and Society (STS) Cluster,
Asia Research Institute (ARI)
National University of Singapore, Republic of Singapore)

Gregory Clancey is Master of Tembusu College at NUS and an Associate Professor in the Department of History and the Asia Research Institute (ARI) at the National University of Singapore. At ARI, he is the Leader of the STS (Science, Technology, and Society) Research Cluster. Until July, 2010, he was Assistant Dean of the Faculty of Arts and Social Sciences, and served on many university-level committees.

A/P Clancey's research centers on the history of science & technology, particularly in modern Japan and East Asia. His book *Earthquake Nation: The Cultural Politics of Japanese Seismicity* (Berkeley: U. of California Press, 2006) won the Sidney Edelstein Prize from the Society for the History of Technology in 2007, and was selected as one of the "11 Best Books about Science" for the UC Berkeley Summer Reading List, sent to all incoming Freshmen in

2009.

A/P Clancey received his BA from Bates College (w/ Highest Honors) and his PhD from the Massachusetts Institute of Technology (MIT). He has been a Fulbright Graduate Scholar at the University of Tokyo, and a Lars Hierta Scholar at the Royal Institute of Technology (KtH) in Stockholm. In 2012 he was the recipient of the Morison Prize from MIT for contributions to the field of Science, Technology, and Society.

DEGREES

Ph.D., M.I.T. [Massachusetts Institute of Technology], Doctoral Program in the History & Social Study of Science and Technology (1998)

M.A., Dept. of American & New England Studies, Boston University (1986)

B.A. with Highest Honors, Dept. of History, Bates College (1981) [Junior Year, Harris-Manchester College, Oxford University, U.K.]

EMPLOYMENT

Master, Tembusu College at NUS, July 2010 –

Leader, STS Research Cluster, Asia Research Institute, Aug. 2009 -

Assistant Dean, Faculty of Arts and Social Sciences, NUS, 2006- 2010

Associate Professor, Dept. of History, National University of Singapore, 2006-

Assistant Professor, Dept. of History, National University of Singapore, 1999 – 2006

Post-Doctoral Research Associate, S.T.S. Program, MIT, 1998-99

Architectural Conservator / Historian, Society for the Preservation of New England Antiquities, Boston, Mass., U.S.A., 1990-1992

PI, RESEARCH GRANTS (SELECTED)

"Asian Biopoleis: Biotechnology and Biomedicine as Emergent Forms of Life and Practice", Tier 2 Grant (MOE) and DHSS Grant, 2010-2013, $1,000,000

"STS Speaker Series", FASS Research Cluster Program Grant, 2007-2008, $50,000

"Fabrications: Masculinity, Technology, and Architectural Modernism" Tier 1 Grant (MOE), 2006-2009, $30,000 +

"Natural Disaster in Asian History, Memory, and Culture", Asia Research Institute, 2005 [with Timothy Tsu], $20,000

RESEARCH/WRITING FELLOWSHIPS

Writing Fellow, Asia Research Institute, National University of Singapore, 2003 & 2009

Post-Doctoral Research Associate, S.T.S. Program, MIT, 1998-99

Graduate Fellow, Dibner Institute for the History of Science and Technology, MIT, Cambridge, Mass., 1996-98

Fulbright Graduate Research Fellow, Faculty of Engineering, Architectural History Lab (*kenkyushitsu* of Dr. Suzuki Hiroyuki), University of Tokyo, Japan, 1995-96

Lars Hierta Fellow, Dept. of the History of Science & Technology, Royal Institute of Technology, Stockholm, Sweden, 1995

AWARDS

Morison Prize, Massachusetts Institute of Technology, 2012

Sidney Edelstein Book Prize (for Earthquake Nation: The Cultural Politics of Japanese Seismicity, Berkeley: UC Press, 2006), Society for the History of Technology, 2007

Also selected as one of 11 "Best Books about Science" on UC Berkeley's Summer Reading List for incoming freshmen, 2009

Faculty of Arts and Social Sciences (NUS) Teaching Excellence Award, 2005 and 2006

Samuel & Rose Levinson Prize (for best conference presentation), Society for the History of Technology, 1994

Joan Cahalin Robinson Prize (for best unpublished manuscript), Society for the History of Technology, 1994

Benjamin M. Siegel Prize (for best graduate student essay), Massachusetts Institute of Technology, 1994

Benjamin M. Siegel Prize, Massachusetts Institute of Technology (second place), 1993

Highest Honors in History (for senior thesis), Bates College, 1981

Lecture VI

Understanding and addressing nuclear accident through STS approach

Rethy K Chhem

Director of the Division of Human Health
at the International Atomic Energy Agency

The 2011 Great East Japan earthquake and tsunami followed by the Fukushima nuclear power plant accident is a complex phenomenon with wide-ranging consequences. In order to identify the potential implications on human health, the Division of Human Health (NAHU) of the IAEA initiated a technical expert meeting to conduct an educational needs assessment for physicians, scientists and health professionals who have been called upon to provide a medical response to that compound disaster. STS (Science and Technology Studies) seemed to emerge as an appealing approach to disentangle this situation through a dialogue among radiation scientists, social scientists and humanities scholars. Although the STS approach may not provide ready-made answers to the various health challenges entailed by such a compound disaster, it may help us to truly understand the challenges more clearly, and provide us with a useful conceptual framework in which practical solutions may be developed and applied successfully in the future. NAHU plays an instrumental role by calling for a consultancy meeting on "Global radiation medicine: Educational challenges for academia" in November 2012, which has resulted in the implementation of two STS-oriented projects from 2013 to 2014: "Enhancing radiation medicine education by building capacity of health professionals and medical students" and "Strengthening research cooperation in radiation disaster medicine". We will discuss the outputs and actions of the projects so far. NAHU involves both international and Japanese STS and disaster studies experts as a way to integrate outsider and insider perspectives on the Fukushima accident in order to activate the STS approach to construct new knowledge in

Human Health for health professionals, medical students, and specialists from relevant fields such as sociology, history, anthropology, and psychology.

【Profile】 Rethy K. Chhem （Director of the Division of Human Health at IAEA）

Dr. Chhem was born in Cambodia. He holds a medical degree from the University of Paris VI, a PhD in education and a PhD in history, both from the University of Montreal. He is currently the Director of the Division of Human Health at the International Atomic Energy Agency. He represents the IAEA at various organizations: UNSCEAR (United Nation Scientific Committee on the Effects of Atomic Radiation), World Health Assembly, WHO/IAEA Cancer Control Joint Program and is the Co-Chair for WG4 (Radiological Consequences on Human Health): IAEA Comprehensive Report on Fukushima Accident. To date, he has published 12 books, over 70 peer reviewed journal articles, and given more than 400 conference presentations, including: 'Radiation Disaster Medicine: Perspective from the Fukushima Nuclear Accident', 'Radiology Education: Measuring Clinical Performance', 'Medical Imaging and Philosophy', 'The Practice of Radiology Education: Trends and Challenges', 'Radiology Education: The Scholarship of Teaching and Learning', and 'Paleoradiology: Imaging Mummies and Fossils'.

Abstracts

Poster session

February 15, 2014
16:00~18:00

International Conference Center
Hiroshima
Room: Dahlia 2

The accumulation of Cs-137 in the leaves of coniferous trees, Abies firma, in Fukushima region, Japan

Yurika Oba*[1], Kiyoshi Shizuma[2], Toshihiro Yamada[1], Toshinori Okuda[1]

[1]Graduate School of Integrated Arts and Sciences Hiroshima University
[2]Graduate School of Engineering Hiroshima University

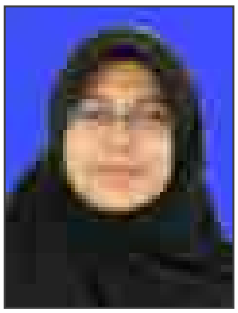
After the Fukushima Dai-ichi Nuclear Power Plant accident in March of 2011, large amount of radionuclides still stay in the forests in the vicinity regions of the nuclear power plant. The distribution and behavior of radiocesium in the forest ecosystem cycles need to be urgently accessed for the immediate practice of decontamination. We investigated the accumulation of radiocesium within leaves of coniferous species, Japanese fir (*Abies firma*) commonly found in Fukushima region in order to clarify spatial distribution of radionuclides within tree bodies of this species.

The study sites were placed within the mixed deciduous forests including coniferous trees in Iitate, Soma and Minami-Soma of Fukushima Prefecture, Northeastern part of Japan. Leaves of *Abies firma* were collected during the field survey conducted from July 31 to August 5, 2013. A part of sampled leaves were segregated into three different age groups (< 1 year leaves; newly emerged leaves, 1-2 year leaves and > 2 year leaves; old leaves), oven dried (90^{o}C), and powderized for the gamma-rays measurements. The rest of sampled leaves were placed on the imaging plates for 24 hours, and were scanned for detecting the spatial intensity of radiation emission within the sampled leaves that come out as “autoradiographs”.

The results showed that the concentration of Cs-137 were significantly different between the new leaves and the old leaves (Friedman test, p<0.001, df=2, n=19), implying that radionuclide accumulation varies with the leaf age. But there were no significant difference between two old leaf groups. The autoradiographs showed the radioactivity was higher in newly emerged leaves than in the old leaves. For future, we plan to investigate how the radionuclide accumulation varies with the position of tree parts, seasons as well as environmental factors affecting the accumulation of Cs-137 in the trees.

2

Plant Identification and distribution characteristic in relation to radioceasium accumulation and the comparison between physiological characteristic in *in vivo* and *in vitro* studies.



Sharifah Nabihah Syed Othman

Graduate School of Integrated Arts and Sciences, Hiroshima University

Plants, animals and people have always been exposed to ionizing radiation in their natural environments because of variations in distribution of radiation which naturally and artificially occur in the ecosystem. There are many studies have been conducted to prove the ability of plant in remediating industrial toxicity which might also increase the chance to help in cleaning up the environment. Therefore, it is important to investigate and understand the natural potential of the environment in order to control this radiation disruption. This research plan will involve few techniques which include; selected group of plant identification and their distribution characteristic, screening of radioactive composition of radiocesium using gamma-spectometry and autoradiograph imaging plate and lastly, physiological characteristic of selected group of plant in *in vitro* study. As a part of this research plan objectives are trying to explore the extent of radioactive accumulation by selected plants and to examine the possibility of tissue culture technology that have been widely used for rapid multiplication of elite plants either through the process of direct plant regeneration from cultured explants or from callus and cell suspension. The expected result of this research plan is to find the relation between the type of plant and their distribution in the environment, radioactive accumulation and their physiological characteristic in *in vivo* and *in vitro* studies. The hypothesis of this study will includes to determine the relationship between radionuclides accumulation and adherence or adsorption of selected group of plants and to identify the subsequent impacts of radiation toward the selected group distribution in the ecosystems. Hence, this research plan is try to understand the plant characteristic and distribution by focusing on the possible potential such as its adsorption and adherence capabilities to help in phytoremediation process. In this symposium, I am going to introduce my previous studies on the callus introduction from Tongkat Ali (*Eurycoma longifolia* Jack), a tree species commonly found in the tropical rain forest in SE Asia, and discuss the application of callus introduction for the plant species that I am planning to investigate at Fukushima region.

3

VERIFICATION OF THE IMRT AND VMAT PLANS USING HIGH DOSE RATE MODE BEAMS

Yen Hwa Lin, Shuichi Ozawa, Uranchimeg Tsegmed, Takeo Nakashima, Tomoki Kimura and Yasushi Nagata

Department of Radiation Oncology, Graduate School of Biomedical and Health Sciences, Phoenix Leader Education Program, Hiroshima University, Japan

Abstract

Purpose of study: To verify the Intensity Modulate Radiation Therapy (IMRT) and Volumetric Modulated Arc Therapy (VMAT) of Stereotactic Body Radiation Therapy (SBRT) technique for lung and liver cancers using high dose rate mode (flattening filter free: FFF) of *TrueBeam (Varian Inc).*

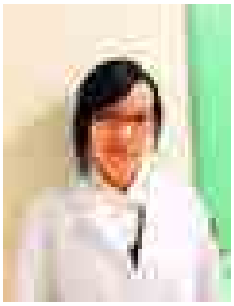
Methodology: IMRT and VMAT treatment planning parameters (speed of MLC, speed of gantry rotation, MU per gantry angle) were optimized using Pinnacle3 Planning System to make each beam irradiated within a single breath hold as long as 15 seconds. The dose distribution of the planned treatment was verified on phantom using Gafchromic film, ionization chamber and 2D-array, and the quality assurance (QA) passing rate base on gamma-index was determined. The actual irradiation time was measured.

Results: SBRT for lung and liver cancers seemed to be possible within 15 seconds of an exhalation breath hold. As a result, it could minimize the impact on the dose distribution caused by the reproducibility of tumor position. The irradiation time of IMRT and VMAT treatments using FFF mode could be achieved within 15 seconds and an acceptable dose distribution was obtained without deteriorating the QA pass rate.

Conclusion: Treatment planning using high dose rate mode enabled shorter irradiation time and higher reliability. The use of FFF beam is promising in the clinical settings.

4

Relationship between FKTN gene expression in gastric cancer and radiation exposure of atomic bomb survivors



Pham Thi Binh Trang, Htoo Zarni Oo, Kazuhiro Sentani, Takuya Hattori, Shoichiro Mukai, Naohiro Uraoka, Naohide Oue, Wataru Yasui

Department of Molecular Pathology,
Hiroshima University Institute of Biomedical and Health Sciences

Gastric cancer is the fourth most common malignancy in the world. It is regarded as one of the radiation-induced malignancies with increasing incidence although atomic bomb accident happened 68 years ago. According to RERF (Radiation Effects Research Foundation), estimation of gastric cancer development involves increased dose of radiation exposure, and the excess relative risks per Gy were 1.20 for mortality and 1.32 for incidence. To identify genes over-expressed in gastric cancer, we utilize Escherichia coli ampicillin secretion trap (CAST) method which is a powerful tool for novel cancer biomarkers. Using gastric cancer cell lines in comparison with normal stomach, random-primed cDNA libraries are generated. By this method, FKTN (Fukutin) has been identified. This is the first analysis on the expression of fukutin protein in gastric cancers among atomic-bomb survivors and the radiation dose response, using immunohistochemistry. We found that FTKN expression was downregulated in high-dose exposed patients than low-dose exposed patients ($p<0.0001$). In addition, its expression was significantly associated with differentiated type of gastric cancer. The result suggested that FTKN gene has a possible relationship with radiation dose exposure and gastric cancer among atomic bomb survivors and we intend to examine additional gastric cancer cases and the underlying mechanism.

5

Identification of ZDHHC14 by CAST method and its significance in scirrhous-type gastric cancer

Htoo Zarni Oo [1], Naoya Sakamoto[1], Naohiro Uraoka[1], Katsuhiro Anami[1], Kazuhiro Sentani[1], Naohide Oue[1], Takashi Oshima[2], Kazuyoshi Yanagihara[3], Wataru Yasui[1]

[1] Department of Molecular Pathology, Hiroshima University Institute of Biomedical and Health Sciences

[2] Gastroenterological Center, Yokohama City University Medical Center

[3] National Cancer Center, Japan

Scirrhous-type gastric cancer (GC) is highly aggressive and has a worse prognosis because of its rapid cancer cell infiltration, accompanied by extensive stromal fibrosis and frequent peritoneal dissemination. *Escherichia coli* ampicillin secretion trap (CAST) method is a powerful technique to identify novel genes that encode secreted or transmembrane proteins. The gene expression profiles were analyzed in GC cell lines, established from scirrhous variant, HSC-44PE and highly metastatic cell line 44As3 derived from HSC-44PE. In comparison with normal stomach CAST cDNA library, cancer specific genes were segregated. Among the candidate genes, Zinc finger, DHHC-type containing 14 (ZDHHC14) showed higher clone count in 44As3 than in HSC-44PE library. High level of ZDHHC14 expression was observed in 27% of GC samples by qRT-PCR. Cell invasion assay and adhesion assay revealed that ZDHHC14 influenced the invasion and adhesive capacity of GC cells. The overexpression of ZDHHC14 was significantly associated with depth of tumor invasion, undifferentiated histology and scirrhous pattern, examined in 123 surgically resected GC tissues by qRT-PCR. Forced expression of ZDHHC14 activated gastric cancer cell migration and invasion *in vitro*. ZDHHC14 identified by CAST method, might be a candidate therapeutic target and supposed to be associated with substrates linked to dissemination cascade of scirrhous GC.

6

The utility of microRNA expression as a potential marker for radiation - associated gastric cancer

○ Yutaka Naito, Naoya Sakamoto, Naohiro, Uraoka, Kazuhiro Sentani, Naohide Oue, Wataru Yasui

Department of Molecular Pathology
Hiroshima University Institute of Biomedical & Health Sciences

In the present study, we analyzed expression profile of microRNAs (miRNAs) in gastric cancers (GCs) among atomic-bomb survivors by miRNA microarray and identified 6 miRNAs (miR-21, 24, 34a, 106a, 143, 145) with higher expression in GCs from exposed cases in comparison with those from non-exposed cases. We investigated whether these miRNAs are useful as potential markers for radiation-associated GC. Quantitative RT-PCR analysis confirmed that levels of miR-143 and miR-145 were significantly higher in exposed GC cases than in non-exposed GC cases. We also investigated the function of miR-143/miR-145 cluster in GC. miR-143 and miR-145 were expressed at higher levels in normal fibroblast or cancer-associated fibroblast cell lines than in GC cell lines, indicating that major source of miR-143/miR-145 in cancer tissues is derived from stromal fibroblast rather than cancer cells. Furthermore, functional analysis showed that miR-143 and miR-145 might regulate collagen type III and α-SMA expression in fibroblast cell lines, respectively. These data suggest that miR-143/miR-145 cluster is putative marker of radiation-associated GC. Now, we are also investing other miRNAs about their role in radiation-association GC cases and the study currently is in progress.

Current research plan for improving victims' physical fitness and quality of life

Nobuaki Moriyama, PT, Yukio Urabe, PhD, PT, Noriaki Maeda, PhD, PT

The Graduate School of Biomedical and Health Sciences, Hiroshima University

Background

Minamisoma City in Fukushima Prefecture was strongly affected by the radiation disaster after the Great East Japan Earthquake on March 11, 2011. We, graduate students of Phoenix Leader Education Program have learnt what kind of problems remain there through short-term fieldwork in August 2013. Especially in terms of health condition of victims, some of residents at temporary housings said that they had less opportunity to go outside and work, and got their fitness worse. It is well known that change of their life style or circumstances which surround them due to the disaster may cause the problem that they decrease their ability of basic motion such as standing up, safe walking, taking a bath, etc.

Purpose

It is necessary to clarify whether the change in victims' life after the radiation disaster influence those living spaces, and to take drastic measures for improving victims' physical fitness. Therefore authors plan to execute the research that becomes the help for victims. The purpose of this research is as follows:

1) To clarify whether victims who were obliged to change their life style may decrease their chances to go outside and their physical abilities
2) To provide victims opportunities to do exercise according to the outcome to improve their physical ability

Materials and Methods

Expected subjects are victims living at temporary housings or their houses in Minamisoma City.

In this research, Elderly status assesment set (E-SAS) which was advocated by the Japanese Physical Therapy Association will be used as a scale of life space of subject. E-SAS has six items which maeasure not only their life space but also their abilities of their daily life. Additionally, E-SAS is helpful for subjects to recognize their present status as an enternalizaed and visualized data.

The outcome of our intervention will be evaluated by comparing E-SAS scores of each subject before and after intervention.

Details of research method are under planning.

This research is based on the belief that regulation of physical exercise for victims may help them to maintain their fitness and life space.

Expected result

The outcomes of intervention for victims of radiation disaster haven't been reported yet. The result obtained from this research may contribute to establish how we should support to take care for victims, as especially frail elderlies.

8

The evaluation of ionization chamber sensitivity with neutron by monitoring dose in Boron Neutron Capture Therapy

THANH TAT NGUYEN [1], KENICHI TANAKA [2], TSUYOSHI KAJIMOTO [1], CHIEN CONG NGUYEN [1]*, SATORU ENDO [1]

[1] Graduate School of Engineering, Hiroshima University
[2] Center of Medical Education, Sapporo Medical University
*Present affiliation: Engineering Dept., Quantum Equipment Division, S.H.I, ltd.

Boron Neutron Capture Therapy (BNCT) is one of techniques of cancer treatment which use of high linear energy transfer (LET) particles. In principle, BNCT is based on the boron neutron capture reaction $^{10}B(n,\alpha)^{7}Li$ with boron chemicals concentrated to tumor cells. These α particle and ^{7}Li nuclei have short ranges in tissue (~9μm and 5μm respectively) of which are similar to the diameter of a cell nucleus. Therefore, treatment dose could be concentrated to tumor cells. In Hiroshima University, the accelerator with a Li target covered by Be has been considered as the BNCT neutron source. This target was designed with diameter Φ120mm, thickness 20μm and 100μm of Be cover and Li respectively.

In BNCT, it is necessary to determine the boron neutron dose, gamma ray dose, and fast neutron dose in tumor and also normal cells while treatment irradiation. Especially, monitor for boron neutron dose to tumor is important for the appropriate treatment. There are various the techniques to carry out this task such as activate gold foil; however gold activation method cannot monitor the dose components above while irradiation. Therefore the triple chambers method which is able to monitor each dose components while irradiation is proposed in this research. This method uses three ionization chambers correspond with their function as C-CO_2 for gamma-ray dose determination, a TE-TE for fast neutron and gamma-ray dose determinations, boron loaded TE-TE ionization chambers (TE_B-TE) for total dose including a boron neutron dose determination. The principle of these ionization chambers are based on ratio of kerma from the wall to gas of calibration radiation field with interested radiation field, this ratio is called sensitivity, each ionization chamber has different sensitivity with fast neutron, thermal neutron and gamma ray. Through method, instead of direct calculation of boron neutron dose in tumor, the sensitivities of ionization chambers with neutron and gamma ray will be determined.

To obtain the sensitivities k_T, k_U, h_T, h_U, k_B, h_B, a_B (k, h, α are sensitivity of fast neutron, gamma and boron neutron respectively; subscriptions of T, U, B for TE-TE chamber, C-CO_2 chamber and TE_B-TE chamber respectively), a Monte Carlo code, PHITS is used for obtaining spectra of recoil particles produced by neutrons and secondary electrons produced by gamma-rays in the cavity of ionization chambers, the average energy produces ion pair (W) is calculated, besides that base on the neutron and gamma ray spectra, kerma ratio is also determined. Since, the sensitivities are calculated by applying these W value and kerma ratio value. The sensitivity of fast neutron in TE-TE chamber and C-CO_2 chamber in this research are checked with mono-energic neutrons and the neutrons from ^{252}Cf source. The calculation results show consistencies with the previously accumulated data by researchers. Hence, this method can be applied for calculating with the neutron and gamma-ray mixed field from the Hiroshima University target. The obtained sensitivity results are k_T = 0.964, h_T = 0.992. The calculation results for the C-CO_2 ionization chamber are k_U = 0.03, h_U = 1.002. The calculation results of sensitivities of all radiation components in TE_B-TE ionization chamber with the various ^{10}B concentrations. The sensitivities of fast neutron component and gamma-ray component in TE_B-TE chamber are the same with those of the values for TE-TE chamber: k_B and h_B to be equal 0.965 and 0.992, respectively. The a_B values respect to ^{10}B concentrations show a small dependence which values of a_B are 0.876, 0.862 and 0.863 for 10, 50 and 100 ppm of boron concentration respectively. The calculation results have good reliability with uncertainty of total absorbed dose is around 5 percent.

Migration process of radiocesium to deeper part of soil in deciduous forests in Fukushima

M. Takada[1], Y. Oba[1], W.I. Nursal[1], K. Shizuma[2], T. Yamada[1], T. Okuda[1]

[1] Graduate School of Integrated Arts and Sciences, Hiroshima University

[2] Graduate School of Engineering

Transfer process of radioactive materials in the environment should be revealed when radiation disaster occurs. In the case of the Fukushima accident, huge amount of radiocesium was deposited in forest areas. Soon after the accident, radiocesium may have deposited on litter on the forest floor, and then will move into deeper part of the soil over time. The objective of this study is to reveal migration process of radiocesium from litter to deeper part of the soil (10 cm depth from surface of soil) in secondary deciduous forest in Fukushima, investigating temporal change of radiocesium amount in litter, surface soil (0 – 5 cm) and deeper soil (5 – 10 cm) for several years. This is the progress report. The study site consists of six plots placed in Minami Soma, Soma and Iitate regions of Fukushima prefecture. The forests are secondary deciduous forest dominated by *Quercus serrata*, *Quercus crispula*, *Acer pictum* and *Acer rufinerve*, mixed with some coniferous evergreen species; *Abies firma*, *Pinus densiflora* and *Cryptomeria japonica*. One sample set consists of litter, surface soil and deeper soil. From 8 to 24 sample sets were collected at one study site. Field surveys were conducted in August and December 2013. The samples were dried and then measured by a germanium detector (GEM Series HPGe Coaxial Detector System). The amounts of radiocesium in litter, surface soil and deeper soil at six plots in August 2013 were 32 – 346 kBq/kg, 2 – 22 kBq/kg, and 0.3 – 11 kBq/kg, respectively. This result indicates that large amount of the radiocesium still remains in litter even though two and a half years have passed after the accident. With the assumption that radiocesium would not move at each layer, it will take approximately 80 years to be reduced to one-tenth of the amount of radiocesium. While, with the assumption that radiocesium deposited on litter moves into deeper part of the soil over time, decrease speed of radiocesium amount in litter is thought to be faster than only physical decay speed. In the case of deeper soil, decrease speed of radiocesium amount is thought to be slower than physical decay speed due to input of radiocesium from upper parts.

10

Relationship between Metal Ion Concentration and Microbial Mat Activity in Higashi-Hiroshima Campus, Hiroshima University

Atsushi SASAI[1)], Kazuki KOGA[2)], Hiroki YASUHARA[2)], and Satoru NAKASHIMA[3)]

1) Faculty of Science, Hiroshima University
2) Graduate School of Science, Hiroshima University
3) Natural Science Center for Basic Research and Development, Hiroshima University

We have studied environmental radioactivity of the water sample in Higashi-Hiroshima Campus, Hiroshima University to check that radioactive nuclides discharged from the radiating facility of Hiroshima University are extremely low compared with regulation values. In the course of the study, we observed an interesting seasonal change of the environmental radioactivity in the sewage sample. It was suggested that the coexisting chemical substances or microorganisms affect the change of environmental radioactivity. On the other hand, brownish yellow microbial mats are growing at the pond and river in Higashi-Hiroshima Campus, Hiroshima University. The microbial mats capture iron hydroxides produced through biomineralization. In the present study, we studied the relationship between metal ion concentration and microbial mat activity in the water samples of Higashi-Hiroshima Campus, Hiroshima University.

The microbial mats were collected from Higashi-Hiroshima Campus. We succeeded in taking an electron micrograph of the microbial mats. EDX revealed that they contain some iron, aluminum, silicon and phosphorus. We measured iron ion concentrations in water of twelve sample points with and without microbial mats. Iron ion concentrations for sample points with microbial mats are higher than those for sample points without microbial mats. We performed adsorption experiment. The autoclaved microbial mats discharged some potassium ion in the potassium solution, while the non-autoclaved microbial mats adsorbed potassium ion in the potassium solution. The result suggests that the living microbial mats adsorb potassium ion, while the dead microbial mats desorb potassium ion.

Corporate Social Strategy for the Reconstruction of Radiation Disaster Areas

Kazumi Sera

Graduate Student, Graduate School of Social Sciences, Hiroshima University

Background

Sustainable works are important in the area reconstruction affected by radiation disaster of the Great East Japan Earthquake.

Business continuity and corporate social responsibility are required for corporations as well. Some companies have started product development and contribute to town rehabilitation in pursuit of economic and social needs at the same time.

Study Purpose

The purpose of this report is to clarify the reconstruction strategy for disaster areas, which seek economic and social needs at the same time, from the viewpoint of corporate social strategy.

Method

The corporate social strategy is defined, and the case of Toyota Motor Corporation (Toyota) using the specific framework will be analyzed (Fig.1).

Toyota's activities for disaster area reconstruction are confirmed, from the viewpoint of the philanthropy, business, and philosophy, by using framework as shown in Fig.1, and the relationship among activities is analyzed, which clarifies the actual situation of the corporate social strategy.

Results

Toyota's activities to respond to the Great East Japan Earthquake as social issues are confirmed as follows;

(1)Philanthropy for contribute to profitable business (Fig.1 B, C, D, E cells)

In the Tohoku region Toyota has the manufacturing base of Toyota's compact cars, and proceeds philanthropy (D cell) and "Enriching lives of communities" from three directions below.

①*Monozukuri*: Manufacture of automobiles in Toyota Motor East Japan, Inc.(B cell), Cultivate vegetables by business collaboration among agriculture, commerce, and industry(C cell).

②Developing human capability: Establish the Toyota East Japan Technical Skills Academy, and develop human resources (E cell).

③Developing the areas: Build competitive industrial infrastructures that prevent low-carbon and disaster (B cell).

Vision and philosophy
"Always better cars" "Enriching lives of communities"
("Toyota Global Vision" March, 2011)

		Current profitable business	Outside current profitable business
Charity & stewardship	Philanthropy	D "*Kokoro Hakobu Project*" for disaster relief	E Establish the Toyota East Japan Technical Skills Academy, Develop human resource
Charity & stewardship	Institutional responsibility	B Hybrid vehicle, Manufacture of automobiles in Toyota Motor East Japan, Inc., Build industrial infrastructures	C Agriculture-commerce-industry collaboration project, Energy, housing and town-making concepts using hybrid technology, A smart mobility society concepts using safety and communication technology
Obligation	Legal responsibility	A Legal responsibilities	

Fig.1 Toyota's disaster areas reconstruction activities
Source: Produced by the author

(2) Profitable business contributing to the society (Fig.1 B, C cells)

Make the concepts of energy, housing and town-making, which have core technology of the hybrid that Toyota has developed, and make a smart mobility society in the future which has core technology of the safety and communication (C cell). These activities aim to "Always better cars" (B cell).

As a result of the analytical work using the framework explained above, Toyota is gaining competitiveness by the Toyota's strengths such as manufacturing and hybrid technologies (B, C cells). These activities are connected with human resources and local economy developments (C, D, E cells).

Some of corporate social strategies are clarified, that could solve social issues and gain competitiveness through the work of (1) and (2) altogether.

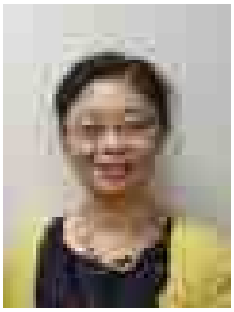
Conclusion

Toyota's activities for disaster area reconstruction are analyzed using the framework of Fig.1. Then, corporate social strategies are clarified, which could achieve the economic and social needs at the same time.

As a result of these analyze, corporate social strategy could be found, that is overcoming the social issues and gaining competitiveness, by connecting with corporate's strengths and philanthropy.

12

Sero-epidemiological Study on hepatitis viral infection among school students in Cambodia



Mayumi Fujimoto[1], Hiroko Yamada[1], Tomoyuki Akita[1], Olline.Lim[2], Sirany.Hok[2], Junko Matsuo[1], Yuko Go[1], Son Huy Do[1], Noboru Goto[3], Keiko Katayama[1], Somana Svay[2], Junko Tanaka[1]

[1]Department of Epidemiology Infectious Disease Control and Prevention, Hiroshima University Institute of Biomedical and Health Sciences
[2] Ministry of Health, Phnom Penh, Cambodia
[3]Department of Management Studies, Graduate School of Social Sciences, Hiroshima University

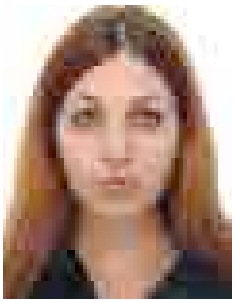
[Aim] We investigated the prevalence of hepatitis B virus(HBV) and hepatitis C virus(HCV) among school students in Cambodia.

[Method] Sero-epidemiological survey was performed in Sasar Sdam Elementary School in Siem Reap province, Cambodia, in Feb. 2011, Feb. 2012 and June 2013 among the 3rd grade students. With written consent from parents, questionnaire survey and hepatitis screening were done. Questionnaire was consisted of potential factors of hepatitis viral infection. Hepatitis viral markers, quantity of HBV DNA and HCV RNA, and genotyping were tested. This study is approved by the ethical committee of Hiroshima University and that of Ministry of Health in Cambodia.

[Results] Total number was 230, 103 males(44.8%) and 127 females(55.2%). Age distributed from 7 to 14 (average age: 9.2±1.1 y.o). HBsAg positive cases were 7 (3.0%, 95%CI: 0.8-5.3%). They were all positive for HBV DNA, 6 of them were genotype C. Anti-HBc was positive in 27 cases (11.7%, 95%CI:7.6-15.9%) and anti-HBs was positive in 38 cases (16.5%, 95%CI: 11.7-21.3%). Only one case (0.4%, 95%CI: 0.0-1.3%) was positive for anti-HCV, but HCV RNA was not detected. Risk factors of HBV and HCV infection will be analyzed with multivariate logistic regression.

[Conclusion] Prevalence of HBV carrier was 3.0%, and 77.4% of students were negative for all HBV markers. We need to clarify the pathway of hepatitis viral infection by incidence survey and make the appropriate strategy to prevent Cambodian children from hepatitis viral infection.

Individual difference of radiosensitivity detected by cytokinesis-block micronucleus assay



Ekaterina Royba, Silvia Natsuko Akutsu, Tatsuo Miyamoto, and Shinya Matsuura

Department of Genetics and Cell Biology, RIRBM, Hiroshima University

The Fukushima nuclear power plant accident has increased the social anxiety to radiation damages on human body. The current system of radiological protection is uniformly established to the public, whereas it is important for the radiation risk communication to evaluate the individual radiosensitivity.

DNA double strand-breaks (DSBs) induced by ionizing radiation are recognized and fixed by the DNA repair system. Dampened DNA repair system causes chromosomal aberrations and cell death to induce acute and/or chronic radiation syndromes. Cytokinesis-block micronucleus assay is a highly sensitive detection method for cellular radiosensitivity, which is based on a cellular event that when cells with unrepaired DSBs enter to mitotic phase, micronuclei form during telophase. Previous studies using peripheral blood lymphocytes suggested that the individual differences of radiosensitivity exist in human populations and DNA repair gene variants are the major determinant.

To verify that DNA repair gene variants are indeed involved in individual difference of radiosensitivity, we studied radiation-induced micronucleus formation in B cell lines established from patients with radiation hypersensitive disorder, Nijmegen breakage syndrome (NBS), caused by germline mutations of *NBS1* gene, and compared with the cells from their family members. Cells from a normal individual ($NBS1^{+/+}$) showed no appreciable increase of micronucleus formation, whereas cells from the patients ($NBS1^{-/-}$) exhibited a much increase after irradiation. Cells from the heterozygous carriers ($NBS1^{+/-}$) all showed intermediate response between a normal individual and the NBS patients. These results imply that the variations on DNA repair genes might underlie the heterogeneity of radiosensitivity in human populations.

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Hepatitis B and C virus infections among the general population in the South of Vietnam: seroprevalence, genotypic distribution and risk factors.

Son Huy Do [1, 2], Hiroko Yamada[1], Mayumi Fujimoto[1], Tomoki Sato[1], Terumi Kaishima[1], Toshihiko Matsuoka[1], Toshiko Fujii[1], Masayuki Ohisa[1], Yuko Go[1], Junko Matsuo[1], Keiko Katayama[1], Nhon Van Nguyen[2], Junko Tanaka[1]

1. Department of Epidemiology, Infectious Disease Control and Prevention, Institute of Biomedical and Health Sciences, Hiroshima University, Hiroshima, Japan.
2. Department of Health of Binh Thuan Province, Binh Thuan, Vietnam.

Introduction: Liver cancer, which is the most frequent cause of cancer death in Vietnam, are predominantly attributed to hepatitis B virus (HBV) and hepatitis C virus (HCV) infections. Therefore, we investigeted HBV and HCV infections for seroprevalence, genotypic distribution and risk factors among the general population in Binh Thuan, a province located in the South of Vietnam, for planning preventive strategies against these infections.

Methods: Our sero-epidemiological study consisted of questionnaire survey on some characteristics and risk factors, and serologic testing for determining HBV and HCV infections. Sample size was calculated based on the anticipated rate of hepatitis B surface antigen (HBsAg) of 20.0%. Subjects were randomly sampled using multistage method. Subsequently, about 6 months later, initial subjects were partly recruited and tested again in confirmation survey for differentiating acute from persistent HBV infection among HBsAg-positive individuals, as well as detecting incident HBsAg-positive cases and HCV infections among susceptible persons. This study was approved by the Ethics Committee of Hiroshima University and that of Department of Health of Binh Thuan Province. Informed consents were obtained from all participants.

Results: Totally 509 participants, including 230 males (45.2%) and 279 females (54.8%), were enrolled. Age distribution ranged from 20 to 81 years old.

Prevalences of HBsAg, HBsAb and HBcAb were 15.3% (95% CI: 12.2-18.5%), 60.3% (95% CI: 56.0-64.6%) and 71.7% (95% CI: 67.8-75.6%), respectively. Most of HBV DNA-positive sera were classified as genotype B (58/77; 75.3%), and C (9/77; 11.7%). Of HBsAg-positive subjects, 96.7% (29/30) were persistently infected and one acutely HBV infected person was identified in confirmation survey. HBsAg-positivity incidence was 0 (95% CI: 0-29.5 per 100 person-years). Multivariate analysis found that HBsAg positivity was associated to age of 50 or over (OR: 0.3, 95% CI: 0.1-0.6, $p<0.001$), fishermen (OR: 3.5, 95% CI: 1.1-10.1, $p<0.05$) and family history of liver disease (OR: 3.0, 95% CI: 1.7-5.2, $p<0.0001$).

Prevalences of anti-HCV and HCV RNA were 3.4% (95% CI: 1.7-4.9%) and 1.8% (95% CI: 0.6-2.9%), respectively. HCV genotype 6a was prominent (5/9; 55.6%). HCV incidence was 0 (95% CI: 0-4.9 per 100 person-years). Multivariate analysis indentified that anti-HCV positivity was related to age of 50 or over (OR: 9.2, 95% CI: 1.6-175.7, $p<0.005$).

Conclusion: In Vietnam, HBV and HCV infections are highly endemic with the predominance of HBV genotype B and HCV genotype 6a. HBV acquisition in early childhood is essential whereas horizontal HBV transmission in adulthood is also important.

Function of RAD18 on radioresponse

Yanbin Xu[1], Megumi Sasatani[1], Hidehiko Kawai[2], Kenji Kamiya[1].

[1]Department of Experimental Oncology, [2]Department of Molecular Radiobiology, Research Institute for Radiation Biology and Medicine, Hiroshima University, Hiroshima 734-8553, Japan.

DNA damage can be induced by environmental insult as well as endogenous metabolism. To maintain genome integrity, the cells have evolved various DNA repair systems. Post- replication repair is one of the repair systems and referred to as DNA damage tolerance. Post-replication repair pathway can bypassed DNA lesions to restart DNA replication without removing the DNA damage. This process involves template switching and translesion DNA synthesis. RAD6-RAD18 complex plays the important role to regulate its pathway. It has been reported that absence of RAD18 sensitize to a variety of DNA damaging agents such as ionizing radiation and display enhanced genomic instability.

In this study, in order to better understand the role of post-replication repair on radioresponse and its molecular mechanisms, the cellular responses to ionizing radiation were investigated using RAD18 knockdown human cell line.

Our results demonstrated that RAD18 contributes to signal transduction pathway after radiation exposure. It is assumed that post-replication repair plays a critical role to maintain genomic stability after radiation exposure.

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One Consideration Concerning Migration Pathway of Radioactive Materials from FDNPP to Ishikari Bay

Yasushi Nabae[1] and Satoru Nakashima[2]

1) Radioactivity Environmental Protection Course, Phoenix Leader Education Program for Renaissance from Radiation Disaster, Hiroshima University
2) Natural Science Center for Basic Research and Development, Hiroshima University

On March 11, 2011, East Japan great earthquake disaster occurred. The Fukushima Daiich Nuclear Power Plant (FDNPP) suffered greatly from tsunami as it, and caused a hydrogen gas explosion. Thereafter, a large quantity of radioactive material leaked to the atmosphere and the ocean. Fukushima prefecture was polluted by the plume. The plume went to northwest from FDNPP first, and then went to southwest through Naka-Dori, and the ocean was also polluted. The pollution with the radioactive material caused serious damage. The pollution of ocean was not homogeneous. Interesting point is that the ^{134}Cs was detected in Ishikari Bay and the radioactivity was 1.9 mBq/L. In the present study, we discussed the possibility of migration pathway of radioactive materials from FDNPP Ishikari Bay.

There are several possibilities of the migration pathways. The first possibility is via air. But this possibility will be denied from the route of plume. The second possibility is that the radioactive materials in Pacific Ocean passed through the Tsugaru Strait and reached Ishikari Bay. But this possibility is also denied because the mean sea level of the Japan Sea is higher by 25cm than a mean sea level of the Pacific.[1] Therefore it is always an east current. Our assumption is that the radioactive material firstly reached Japan Sea via river and then reached Ishikari Bay. One of the possibilities is Agano River from Fukushima to Japan Sea, and then the ^{134}Cs reached Ishikari Bay along the Tsushima Current.

^{134}Cs is accumulated in the soils under Agano River.[2] This soil does not elute cesium in the water. However, when this soil is in the seawater, it elutes 3.5% of cesium.[3] There is no ^{134}Cs outside of Tsushima Current in Japan Sea. This is the reason why ^{134}Cs reached Ishikari Bay along the Tsushima Current. We are now considering the stream of ^{134}Cs from a quantitative point view.

1) http://www1.kaiho.mlit.go.jp/KANKYO/TIDE/enkan/Suijun_hyo/Pub.No741/index.pdf, accessed on December 23, 2013.
2) http://www.pref.niigata.lg.jp/housyanoutaisaku/1339016506464.html, accessed on December 23, 2013.
3) http://www.scopenet.or.jp/main/research/pdf/h25/h25hapyou1.pdf, accessed on December 23, 2013.

Approaches to Effective Decision-Making among Multi-groups with Conflicting Interests

Fumie YAMAGUCHI, Kiriko SAKATA

Graduate School of Integrated Arts and Sciences, Hiroshima University

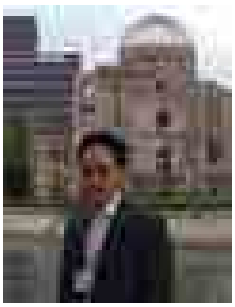
In life, people usually belong to groups, and intergroup conflicts arise between groups. Over the years, intergroup relationships and conflicts have been investigated in social psychology. Especially, causes and solutions of intergroup conflicts have been examined. Conflicts of interest between multiple-groups are unavoidable in life and if the cause of a problem remains unsolved, groups have to seek solutions, or settle the problem through confrontation.

The Fukushima Daiichi Nuclear Power Plant accident is one example of a conflict in which many groups had to face and resolve different problems, in spite of having different conflicts of interest between the groups. There are a variety of groups with conflicting interests in the process of recovery from the radiation disaster, including the State, municipalities, private companies, local society, and families, among others. Conflicts between groups may interfere with recovery, and therefore, groups are required to resolve conflicts by removing the causes of conflicting interests, or deal with the issues arising from conflicting interests.

Although causes of conflicts have been discussed in previous studies on intergroup conflicts, in this study, we have focused primarily on the methods of dealing with solutions for conflicts and investigated the effective decision-making process of multiple groups with conflicting interests.

18

Roles of damage-associated molecular patterns (DAMPs) in septic and trauma patients



Ho Minh Van, Nobuyuki Hirohashi, Kong Weng Sheng*,Yasuto Kanno*, Koichi Tanigawa

Department of Emergency and Critical Care Medicine,
*Department of Immunology, Hiroshima University

Background: Sepsis is a serious medical condition characterized by systemic inflammatory response syndrome (SIRS) caused by infection. Uncontrolled inflammatory responses to infection result in the collapse of the cardiovascular function, leading to multiple organ dysfunction syndrome (MODS) and death. Damage-associated molecular patterns (DAMPs) are danger signals, which are released during SIRS, and stimulate macrophages to produce IL-1β which is an important mediator of the inflammatory response. DAMPs are involved in a variety of cellular activities including cell proliferation, differentiation, and apoptosis.

Purpose: To investigate DAMPs activities in the serum of septic and trauma patients.

Material and Method: Patients admitted to the ICU of Hiroshima University Hospital were enrolled. Serums of the patients on admission were analyzed for DAMPs activity at the Immunology department where researchers were blinded to the clinical data. DAMPs activity assays used THP-1 derived macrophages, which provide a well characterized DAMPs-induced secretion model of IL-1β. THP-1 cells were treated with PMA for differentiation. Cells were treated with serums of the patients. Cell culture medium was used for detection of IL-1β by Enzyme-linked immunosorbent assay (ELISA).

Result: Twenty patients participated in this study. The mean concentrations of IL-1β in septic and trauma patients were 252.6±59.1 and 317.2±61.1 (pg/mL) respectively. We also measured the concentration of IL-1β in macrophages stimulated by Monosodium Urate (MSU) as positive control, which was 618.4±14.3 (pg/mL). As negative control, the concentration of IL-1β produced by untreated THP-1 was 417.7±99.0 (pg/mL).

Conclusion: In this preliminary experiment, DAMPs activities could not be detected in the serum of the ICU patients on admission. Interestingly, the concentrations of IL-1β in septic and trauma patients were less than that of negative control. These results indicated that serum factors of these patients might have the inhibitory effects on macrophage activation.

Risk factors for hepatitis viral infections (HBV, HCV) among adults in Cambodia based on the sero-epidemiological study.

Hiroko Yamada[1], Mayumi Fujimoto[1], Masayuki Ohisa[1], Olline Lim[2], Sirany Hok[2],Junko Matsuo[1], Yuko Go[1], Son Huy Do[1], Noboru Goto[3], Keiko Katayama[1], Somana Svay[2], Junko Tanaka[1]

1.Department of Epidemiology Infectious Disease Control and Prevention, Hiroshima University Institute of Biomedical and Health Sciences
2.Ministry of Health, Phnom Penh, Cambodia
3.Department of Management Studies, Graduate School of Social Sciences, Hiroshima University

Aim: We investigated the hepatitis B virus (HBV) and hepatitis C virus (HCV) infections on seroprevalence, genotypic distribution and risk factors among adults of general population in Cambodia. Based on the results, we aim to consider the prevention strategy in cooperation with Ministry of Health in Cambodia.

Methods: Sero-epidemiological study, which consisted of questionnaires and taking blood samples for determining HBV and HCV infections, was performed 4 times from 2010 to 2012 among the general population over the age of 18 in Siem Reap province in Cambodia. Statistical analyses were performed to clarify the possible risk factors related to HBV and HCV infections.

Results: Total participants were 483 adults, including 194 males (40.2%) and 289 females (59.8%). Age distribution was from 18 to 89 years old as of 2012. The prevalence of HBs Ag was 4.6% (22/483; [95% CI: 2.7-6.4%]) and HBV DNA were classified as genotype C (22/22). On the other hand, the prevalence of HCV RNA was 2.3% (11/483; [0.95-3.6%]) and they were classified as genotype 6 [6f (3), 6e (2), 6s (1)] (6/11; 54.5%), as genotype 1 (1b) (3/11; 27.3%), and 2 (18.2%) were not determined. In a multivariate logistic regression, history of operation was significantly associated with positivity for HBV infection (AOR: 1.9 [1.0-3.7]; p=0.0485), and history of blood transfusion was significantly associated with the positivity for HCV RNA (AOR: 30.8 [1.0-575.3]; p =0.0231).

Conclusion: In this study, the prevalence of HBV carriers was 4.6%, and that of HCV carriers was 2.3%. Furthermore, it was suggested that history of operation and history of blood transfusion may be a potential risk factor for HBV infection and HCV infection, respectively. It is necessary to encourage vaccination against HBV and increase the safety of medical treatment for prevention of HBV and HCV infections.

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Their talkings were accompanied by negative feelings: a qualitative study with Japanese atomic bomb survivors.

Kazuhiro Watanabe and Yasumasa Otsuka

Department of Psychology, Graduate school of Education,
Hiroshima University

[Background and Purpose]

Atomic bomb survivors were injured by the bomb blast and following radioactivity not only physically but also psychologically. They had various negative feelings such as anxiety for their health, their children, and other (Hamatani, 2005). In this study, we investigated what words they used when talking to their atomic bombing experience with negative feelings and how those words were related one another, including interviewing data from the Hiroshima and Nagasaki atomic bomb survivors.

[Method]

Twenty-eight talkings were extracted from atomic bomb survivors which included "fear", "anxiety", "worry", or "difficulty" in "*Death in Life －Survivors of Hiroshima*－ (Lifton, 1967; 2009)". We adopted the text mining method, conducting morphological analysis and syntactic analysis, and words which have relations with negative feelings were distilled. Principal component analysis, cluster analysis, and correspondence analysis were conducted in order to investigate the relationships among these words.

[Results]

We distilled 37 words from the literature. Using these words, 13 principal components were extracted and 10 clusters were found (Figure 1). As a result of correspondence analysis, clusters that especially related acute influence of the atomic bomb and the radioactivity were "Sentence of death", "Incomprehensive mass phenomena", "Audio-visual memories", "Suspicion for condition". Clusters that related chronic influence were "Remaining impacts", "Eternal change", "Disorder due to the bomb", "Next generations", "Social stigmatization", "Use of nuclears".

[Conclusion]

Atomic bomb survivors have negative feelings for many domains. Survivors may believe that the influence of atomic bomb and the radioactivity on their and subordinates' health were continued chronically. Resolving the negative feelings for atomic bomb survivors might still be important even around 20 years after the atomic bombings.

Development of Ground Cutoff Materials Used for Coastal Disposal Facilities For Wastes Contaminated by Radioactive Cesium

Ooki KURIHARA, Hiroki MURAKAMI, Takashi TSUCHIDA, and Taiki ABE

Graduate School of Engineering, Hiroshima University, Japan

Introduction

A large amount of waste contaminated by radioactive cesium was produced in and around Fukushima by the Great East Japan Earthquake on March 11th, 2011 and the Fukushima Daiichi nuclear disaster. This study focuses on the coastal disposal facilities which can have large area and deep depth. The purpose of this study is developing the cutoff material used for coastal disposal facilities of disaster wastes or decontamination wastes contaminated by radioactive cesium. Thus, marine clay and bentonite are focused on in this study. This study sets up the performance targets and investigates water shielding performance and adsorption performance of marine clay mixed with bentonite in various proportions.

Method of test

Tokuyama clay (ρ_s: 2.616 g/cm^3, w_L: 110.6%) and bentonite (ρ_s: 2.898 g/cm^3, w_L: 510.6%) produced in Wyoming are used in this study. The water shielding performance was valued by the hydraulic conductivity k as showed in Eq.(1)

$$k = c_v \cdot m_v \cdot \gamma_w \quad (1)$$

where, c_v is the coefficient of consolidation, m_v is the coefficient of volume compressibility, and γ_w is the unit weight of water obtained by the consolidation test. This test was conducted for the samples.

The adsorption capacity was also obtained by measuring the concentration of cesium after shaking the cesium solution and the clay-bentonite mixture. The shaking test is conducted for all samples.

The adsorption tests of the samples are carried out using stable cesium solution. The adsorption capacity was measured by the constant head permeability test after the one-dimensional consolidation of 19.6 kPa consolidation pressure. The cesium solution was flowed in the clay-bentonite mixture giving 19.4 kPa air pressure to double pipe burette. The liquid which flowed through the clay-bentonite mixture was picked up for every 10 ml.

Results and Conclusion

1) The hydraulic conductivity of samples decreased by adding bentonite to tokuyama clay but the target cannot be achieved.
2) The performance of adsorption by batch test of samples is almost coincident by adding bentonite to *tokuyam* clay.
3) The performance of adsorption by consolidation and permeability test decreased by adding bentonite to *tokuyama* clay but the target is achieved.

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Generation and analysis of a novel model for chronic myelomonocytic leukemia (CMML) with acquired expression of c-CBL Q367P

Yuichiro Nakata[1], Takeshi Ueda[1], Norimasa Yamasaki[1], Akiko Nagamachi[2], Keiyo Takubo[3], Yasuhiro Ebihara[4], Masashi Sanada[5], Seishi Ogawa[5], Koichiro Tsuji[4], Toshio Suda[3], Toshiya Inaba[2] and Hiroaki Honda[1]

[1]Department of Disease Model, Research Institute for Radiation Biology and Medicine, Hiroshima University, Hiroshima 734-8553, Japan
[2]Department of Molecular Oncology, Research Institute for Radiation Biology and Medicine, Hiroshima University, Hiroshima 734-8553, Japan
[3]Department of Cell Differentiation, Keio University, Tokyo 160-8582, Japan.
[4]Department of Pediatric Hematology/Oncology, The Institute of Medical Science, The University of Tokyo, Tokyo 108-8639, Japan
[5]Cancer Genomics Project, The University of Tokyo, Tokyo 108-8639, Japan

c-CBL functions as an E3 ubiquitin ligase and negatively regulates tyrosine intracellular signal transduction initiated by receptor tyrosine kinases. Recently, we identified c-CBL mutations in most chronic myelomonocytic leukemia (CMML) cases with 11q-aUPD. c-CBL is highly expressed in hematopoietic stem cells (HSCs), and deficiency of c-CBL leads to augmented size of HSC pool on mouse bone marrow (Rathinam et al., 2008). These findings suggest that the dysfunction of c-CBL is implicated in the pathogenesis of the disease, but the precise leukemogenic mechanism(s) remains elusive.

To gain insights into this issue and to create a novel animal model for mutated c-CBL-harboring leukemia, we generated conditional knock-in (cKI) mice that express wild-type c-CBL at steady state and in turn express c-CBL with Q367P mutation (c-CBL$_{Q367P}$) upon Cre activation. After induced expression of c-CBL$_{Q367P}$, the cKI mice exhibited leukocytosis with a rapid expansion of myeloid cells and a sustained elevation of peripheral myelomonocytic cells, which closely resemble phenotype of human CMML. The spleen was massively enlarged with proliferation of immature and mature myeloid cells, and the bone marrow was hypercellular with predominance of myeloid cells. In addition,
constitutive phospholylation of Akt was observed in long-term hematopoietic stem cells (LT-HSCs) in the cKI mice. These results provide *in vivo* evidence that acquired expression of c-CBL$_{Q367P}$ confers a proliferative advantage due to constitutive growth signal and leads to uncontrolled proliferation of myelomonocytic cells. Our cKI mice represent a novel and useful animal model for investigating the leukemogenic mechanisms mediated by mutated c-CBL.

Cesium penetration in mortar subject to wetting and drying

Graduate School of Engineering, Hiroshima University, Japan

Masashi ITO

The accident at the Fukushima Daiichi Nuclear Power Plant resulted in spreading a huge amount of the radioactive cesium widely. It is important to decontaminate the radioactive cesium and dispose the radioactive waste safely as soon as possible. This study aims to investigate the Cesium penetration in mortar subject to wetting and drying. From the experimental results, in the water-saturated mortar specimens, around 80% of the penetrated cesium in the whole area of specimens was soluble. On the other hand, in the dried specimens, 80% of the penetrated cesium was soluble only in the inner area of the specimen. In the surface, 60% of the cesium was soluble. It was found that the cesium was transported with the water penetration or dissipating in the cyclic dying and wetting conditions.

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Processing of integrin αv subunit by autophagy in squamous cell carcinoma cells

Mirei Suematsu[1], Yasutaka Hayashido[3], Taishi Sakaue[1], Takahiko Fujii[1]
Tetsuji Okamoto[2]

[1]Department of Molecular Oral Medicine and Maxillofacial Surgery, Division of Frontier Medical Science, Graduate School of Biomedical Sciences, Hiroshima University
[2]Department of Molecular Oral Medicine and Maxillofacial Surgery, Applied Life Sciences, Institute of Biomedical and Health Sciences, Hiroshima University
[3]Department of Oral and Maxillofacial Surgery, Hiroshima University Hospital

[Introduction]

Integrins are heterodimeric transmembrane receptors for extracellular matrix (ECM) proteins, which consist of one α subunit and one β subunit. Formation of the integrin αβ heterodimer is essential for the expression on the cell surface and the function of integrins. There are at least 18 α-subunits and 8 β-subunits, forming 24 different integrin heterodimers. Integrin αv subunit pairs with 5 different β subunits, β1, β3, β5, β6 and β8 whereas most α subunits dimerize with only one β subunit,

Our previous study has shown that the expression of integrin β8 is regulated by ubiquitin-proteasome system in some squamous cell carcinoma (SCC) cells and that the heterodimer formation with αv subunit contributes to the stability of β8 subunit. In present study, we examined the role of autophagy in post-translational modification of integrin αv subunit in SCC cells. In addition, the participation of the heterodimer formation with β1, β3, β5, β6 or β8subunit in the stability of αv subunit was also investigated.

[Experimental procedures]

The Integrin αv gene was subcloned into the tetracycline inducible expression vector pCDNA4/TO, and the resultant plasmid was termed as pCDNA4/TO/αv. Human vulval SCC cell line A431, which expresses low levels of the mRNAs for integrin αv and its partners, β1, 3, 5, 6, and 8, was transfected with pCDNA4/TO/αv, and A431αv-on cells were isolated. Next, A431αv-on were stably transfected with the mammalian expression vector pCI-neo containing β1, 3, 5, 6 or 8 genes, A431β1/αv-on, A431β3/αv-on, A431β5/αv-on, A431β6/αv-on and A431β8/αv-on were isolated. Altered expression of αv protein induced by incubation with tetracycline was examined in A431αv-on and A431αv-on transfected with the β1, 3, 5, 6 or 8 genes.

[Results]

Treatment with tetracycline for 12h induced the expression of αv protein in A431αv-on cells. Sequential cultivation in the absence of tetracycline led to a gradual decrease in the expression of αv protein in A431αv-on cells, and almost complete loss of αv protein was observed after 24h. The loss of tetracycline-induced αv protein in A431αv-on cells was inhibited by treatment with chloroquine, an autophagy Inhibitor. Loss of tetracycline-induced αv protein was also observed in A431β1/αv-on and A431β5/αv-on cells under on serial cultivation in the absence of tetracycline. In contrast, tetracycline-induced αv protein in A431β3/αv-on, A431β6/αv-on and A431β8/αv-on cells was not altered.

[Conclusion]

Autophagy is involved in the regulation of expression of integrin αv subunit in SCC cells. The possibility should be considered that αv subunit dimerized with β3, β6 or β8 subunit is resistant to autophagy. In contrast, heterodimer formation with β1 or β5 subunit does not contribute to resistance to degradation of αv subunit via autophagy. These findings suggest that the heterodimer β subunits play a significant role in stabilizing the αv subunit. However, the exact mechanism this stabilization is unknown.

Generation and maintenance of human induced pluripotent stem cells in serum-free and feeder-free culture conditions using Sendai virus vectors

Atsuko HAMADA[1], Sachiko YAMASAKI[1], Eri AKAGI[1], Manani OHTAKA[2], Ken NISHIMURA[2], Makoto NAKANISHI[2], Tetsuji OKAMOTO[1]

[1] Department of Molecular Oral Medicine and Maxillofacial Surgery Division of Frontier Medical and Science, Graduate School of Biomedical & Health Sciences
[2] Research Center for Stem Cell Engineering, National Institute of Advanced Industrial Science and Technology(AIST)

【Back ground】

We previously reported the generation of human induced pluripotent stem cells (hiPSCs) from dental pulp cells (DPCs) using hESF9 medium in serum-and feeder-free conditions. Until now, we used retrovirus vectors to integrate exogenous genes (*Oct3/4, Sox2, Klf4, c-Myc*) to host genome. However, this method of integration is a problematic for clinical applications as it includes the risk of tumorigenicity. Here we demonstrated the generation of hiPSCs from DPCs using Sendai virus vectors (SeVdp), an RNA virus that carries no risk of altering host genome, under serum and feeder-free conditions.

【Objective】

The aim of this study was to generate iPSCs from DPCs in serum- and feeder-free defined culture conditions using SeVdp in order to elucidate the cytokine requirements of the cells for self-renewal and inhibit their differentiation.

【Methods and Results】

We generated hiPSCs from DPCs under serum- and feeder-free defined culture conditions using SeVdp with four exogenous genes (*Oct3/4, Sox2, Klf4, c-Myc*). These genes were expressed stably in the cytoplasm in equimolar amounts. The hiPSCs expressed pluripotent markers such as *Oct3/4, Sox2, Nanog, Esg1, Rex-1* by RT-PCR and Oct3/4, Nanog, SSEA-3, SSEA-4, Tra-1-60, Tra-1-81 by protein immunostaining, and they were able to differentiate into the three embryonic germ layers *in vivo* and *in vitro*. The induction efficiency with Sevdp was three times higher than that with retrovirus in serum-free conditions.

【Conclusion】

We have successfully generated hiPS cells from human DPCs using SeVdp in serum-and feeder-free conditions, and the induction efficiency was markedly increased. This methods allows us to elucidate cellular responses to growth factors under defined conditions. These advantages will help clarify molecular mechanisms of iPSCs induction. Moreover, this protocol will be beneficial for clinical applications of iPSCs as SeVdp has no risk of integrating into the host genome.

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Reprogramming efficiencies of DPCs-derived hiPS cells with various virus vectors in serum- and feeder-free culture conditions.

Eri AKAGI[1], Sachiko YAMASAKIi[2], Atsuko HAMADA[1], Yuki TAGUCHI[1], Hanae MUKASA[1], Manani OHTAKA[3], Ken NISHIMURA[3], Makoto NAKANISHI[3], and Tetsuji OKAMOTO[2]

1 Dept. of Molecular Oral Medicine and Maxillofacial Surgery, Division of Frontier Medical Sciences,
Graduate School of Biomedical & Health Sciences, Hiroshima University
2 Dept. of Molecular Oral Medicine and Maxillofacial Surgery, Applied Life Sciences, Institute of Biomedical & Health Sciences, Hiroshima University
3 Research Center for Stem Cell Engineering, National Institute of Advanced Industrial Science and Technology(AIST)

BACKGROUND

We previously reported the generation of human induced pluripotent stem cells (hiPSCs) from dental pulp cells (DPCs) using hESF9 medium in serum-and feeder-free conditions. hiPSCs have been generated using several methods, including 1) DNA-based integrative methods such as retro virus and lentivirus and 2) non-integrative methods such as adenovirus, and 3) DNA-free reprogramming technologies including RNA-based approaches like the Sendai virus (SeVdp) and 4) direct protein delivery. However, reprograming efficiency is different among these reprogramming methods.

OBJECTIVE

This study aims to compare the reprogramming efficiency of DPCs-derived hiPSCs in serum- and feeder-free culture conditions with that in serum-supplemented culture on feeder cells condition with retroviral vectors or SeVdp.

METHODS AND RESULTS

We first tried to generate hiPSCs from DPCs with four factors (Oct3/4, Sox2, KLF-4, and c-Myc) in serum-free or serum supplemented culture conditions by using retroviral vectors. We picked the human embryonic stem cells (hESCs)-like colonies up and continued cultivating in hESF9 on fibronectin-coated dishes (serum-free condition) or in KSR-supplemented medium on feeder cells (serum-supplemented conditions). We evaluated the reprogramming efficiency by virtue of ALP activity. Then we generated hiPSCs from DPCs by using SeVdp, and determined reprogramming efficiency. Using retroviral vectors, the efficiency in serum-free culture conditions was 0.04～0.39％, and that in serum-supplemented culture conditions 0.03～0.29％. On the other hand, using SeVdp, the efficiency in serum-free culture conditions was 0.23～0.3％, and thatin serum-supplemented culture conditions 0.3～1.7％. The iPSCs generated in serum-free culture conditions exhibited flat colony with similar morphology to that of hES cells. These generated hiPSCs continued to proliferate and retained the properties of self-renewal and pluripotency.

CONCLUSIONS

The reprogramming efficiency of hiPSCs with SeVdp in both serum- and feeder-free culture conditions, and serum-supplemented on feeder culture condition was higher than that with retrovirus vector. This protocol using SeVdp in serum- and feeder-free culture will be beneficial for clinical applications of iPSCs as Sevdp has no risk of integrating into the host genome.

Regulation of DNA repair system by nuclear structure proteins

Ning-Ang Liu, Jiying Sun and Satoshi Tashiro

Department of Cellular Biology, RIRBM,
Hiroshima University, Hiroshima 734-8553, Japan

DNA repair plays an important role in keeping genomic integrity. Recent advances in the research field of DNA repair have revealed the role of chromatin reorganization in the regulation of DNA damage response. However, how proteins associated with nuclear architectures are involved in the regulation of DNA repair is unclear.

To investigate the role of nuclear architectures in DNA repair, we searched proteins associated with nuclear structures in the RAD51 protein complex. RAD51 is a key player in homologous recombinational repair (HR) of DNA double strand breaks (DSBs). We identified Lamin B1, a nuclear lamina protein, in the RAD51 protein complex obtained from both irradiated and non-irradiated human cells. The B-type lamins are important structural determinant for the nuclear envelope as a whole, which play important roles in the structural organization and function of the eukaryotic cell nucleus. The depletion of Lamin B1 lead to a significant decrease in RAD51 protein levels of human cells after ionizing radiation (IR). This finding suggests that Lamin B1 is involved in the regulation of RAD51 function following DNA damage. We conjectured that this Lamin B1 depletion would impair RAD51 mediated HR repair after IR. To further explore this notion, we examined the role of Lamin B1 in the RAD51 focus formation. Immunofluorescence staining analysis using anti-RAD51 antibody revealed that the radiation-induced focus formation of RAD51 was significantly repressed in Lamin B1 deficient cells compared to control cells. On the other hand, Sister Chromatid Exchange (SCE), which is mediated by HR, was significantly decreased by the depletion of Lamin B1. Taken together, these findings strongly suggest that Lamin B1 is involved in HR repair by regulating RAD51 function after IR induction of DSBs.

Abstracts

Students

Presentation

February 15, 2014
13:00~15:45

International Conference Center
Hiroshima
Room: Dahlia 1

Research plan and research progress

M. Takada

Graduate School of Integrated Arts and Sciences, Hiroshima University

My research theme is “migration of radiocesium on deciduous forest floor in Fukushima”, and the purpose of the research is to reveal movement of radiocesium in forest ecosystems. Study sites of the research are six secondary deciduous forests in Fukushima region. The research consists of three subthemes. 1) Spatial distribution of radiocesium on forest floor; to reveal distribution pattern relating to tree species and slopes. 2) Downward movement of radiocesium into deeper part of soil, consisting of two subjects; 2-1) to calculate migration rate based on periodical monitoring, 2-2) to reveal migration mechanism of radiocesium from soil surface to deeper part of soil by conducting an experient at study sites. 3) Long term prospects of soil radiocesium; to predict radiocesium concentration in soil using compartment model based on the results of subtheme 2-2. Field survey for the subtheme1 has finished and now survey for subtheme 2-1 and 2-2 is being conducted.

Hiroshima University Phoenix Leader Education Program provides students a lot of opportunities to get advices from not only own supervisor but also specialists from different fields for our research with interdisciplinary and global viewpoints. We held two times of retreats and made a presentation about our study plan, receiving comments and suggestions from teachers. We also held and attended symposia on medical, environmental and sociological topics to improve our problem-solving ability with wide perspective.

What is expected for the future researches

Nobuaki Moriyama

Radioactivity Social Recovery Course
The Graduate School of Biomedical and Health Sciences

Eight of second grade students participated in the short-term field work from 19th to 23rd August, 2013 in Fukushima Prefecture. Through the fieldwork, we have learnt that victims living close to the Fukushima Nuclear Power Plant may be affected by radiation disaster in various points of view.

Recent research indicates that risk of cerebrovascular disease in Minami-soma city may increase after the disaster especially in a group of less than 64 aged persons, although the causes haven't clarified well yet. The disaster also affects their mental state. The other data shows that victims, especially children suffer from mental stress because the radiation disaster was man-made in a sense, and they feel anxious and their lives are limited.

We found from voice of residents at temporary housings that they feel anxious about many uncertainties. They aren't sure when they will be able to go back home they have lived before the disaster. They usually can't complaint to anybody.

Radiation disaster influences residents' lives not only directly but also indirectly. To carry out researches which contribute to their lives may be expected. Collaborative work with many specialists to protect human society from radioactivity is essential.

Track of my activities in Phoenix Leader Education Program

Yurika Oba

Graduate School of Integrated Arts and Sciences Hiroshima University

(Phoenix Leader Education Program: Radioactivity Environmental protection Course)

After entering this Phoenix Leader Education Program, to speak properly, my life has changed after the great earthquake of 2011. I faced the new challenge as the reconstruction of radiation disaster. I entered this program because I wanted to engage in the reconstruction of Fukushima. For about 1 year, I experienced various things in this program. Today I would like to talk about following two experiences.

【The Short-term Fieldwork】

We went to Fukushima as the Short-term Fieldwork from August 19 to August 23, 2013. The Short-Term Fieldwork was made up from the three courses: Radiation Disaster Medicine Course, Radioactivity Environmental Protection Course and Radioactivity Social Recovery Course. This time I would like to talk about Radioactivity Environmental Protection Course and my findings on the fieldwork.

【Research Activities】

My specialty is ecology and my field is forests. Now I study about the accumulation of radiocesium within tree bodies in Fukushima forests. In the past year, I went to the forests many times to measure air dose or to sample the leaves of trees. It was a continuing process of trial and error. But these experiences made me think anew about the important things of field survey. Important to field survey are long-term point of view and the care that must be taken to consider seasonal variations. I will continue the research while I have firsthand knowledge of the organization of environment in field and get more understanding of nature.

Field trip to the nuclear power plant and our study

Yasushi Nabae[1)] and Satoru Nakashima[2)]

1) Radioactivity Environmental Protection Course, Phoenix Leader Education Program for Renaissance from Radiation Disaster, Hiroshima University

2) Natural Science Center for Basic Research and Development, Hiroshima University

Phoenix Leader Education Program involves much training and many field trips to improve a general knowledge of the graduate students concerning a radioactivity. In July 2013, the graduate students and the faculty member made a field trip to the Shimane Nuclear Power Plant.

The Shimane Nuclear Power Plant started commercial operation in 1974. The third unit in the power plant was being built at that time. Because the nuclear reactor was under construction, we could look at the inside of the pressure vessel. I felt that this was a very valuable experience. The staff of the power plant explained to us that they reinforced a breakwater, external electric power and the emergency vehicle for tsunami protection measures. The nuclear power plant has a possibility to suffer from not only the natural disaster but also terrorism threat. The patrol vessel and the plane of the Japan Coast Guard guard the nuclear power plant from a terrorist.

When an accident happens, the nuclear power plant has a possibility to become in the catastrophe. The Fukushima Daiich Nuclear Power Plant (FDNPP) leaked a large quantity of radioactive materials to the atmosphere and the ocean. Important point is that the ^{134}Cs was detected in Ishikari Bay and the radioactivity was 1.9 mBq/L. In our study, we discussed the possibility of migration pathway of radioactive materials from FDNPP to Ishikari Bay. There are several possibilities of the migration pathways. One of the possibilities is Agano River from Fukushima to Japan Sea, and then the ^{134}Cs reached Ishikari Bay along the Tsushima Current. ^{134}Cs is accumulated in the soils under Agano River. Niigata Prefecture reported that 28 Bq/kg of ^{134}Cs was detected in the mud under Matsuura Bridge close to the river mouth. There is no ^{134}Cs outside of Tsushima Current in Japan Sea. We expressed our assumption “One Consideration Concerning Migration Pathway of Radioactive Materials from FDNPP to Ishikari Bay” on a poster.

Medical Field Activity of Phoenix Leader Education Program

Hirotaka Nakatao

Hiroshima university phoenix leader education program student
Radiation disaster medicine course (2nd Grade)
Biomedical & Health Sciences Oral and Maxillofacial Surgery I

Radiation disaster contains great range of issues. But needless to say, most part of people are fearing the radiation effect on their body・Therefore，to understand biological or medical effects of radiation is necessary for renaissance from radiation disaster・From this reason，Phoenix leader education program serves a lot of activities for understanding medical commitment・In this session I'll introduce the medical aspect of Phoenix leader education program, especially Radiation Emergency Assistance Center/Training Site (REAC/TS) training in Oak Ridge, Tennessee US. Oak Ridge was established as top secret city of Manhattan project for developing A-bomb in 1942. Depending by this background, Oak Ridge is important scientific sight and has important role of radiation research. REAC/TS serve some program of training for radiation emergency.　Our second grade LP students attended this program and got information and drill that are very convenient for preparedness of radiation disaster.

We'll do our best with this precious experience to become a radiation disaster treatment leader.

Functional Image-Guided Radiotherapy Planning in Stereotactic Body Radiation Therapy for Hepatocellular Carcinoma with liver cirrhosis

Uranchimeg Tsegmed[1)], Tomoki Kimura[1)], Nakashima Takeo[1)] ,Yuko Nakamura[2)], Toru Higaki [2)], Tsuyosi Katsuta[1)], Nobuki Imano[1)] , Yoshiko Doi[1)], Masahiro Kenjo[1)] , Yuko Kaneyasu[1)] , Shuichi Ozawa[1)] , Yuji Murakami[1)] , Kazuo Awai [2)], Yasushi Nagata[1)]

1) Department of Radiation Oncology, Hiroshima University
2) Diagnostic Radiology, Hiroshima University

Purpose/Objective (s):

To investigate the comparison between anatomical and functional planning of Stereotactic Body Radiotherapy (SBRT) using Intensity Modulated Radiation Therapy (IMRT) for Hepatocellular carcinoma (HCC) through dosimetric analysis.

Materials /Methods: In this study, 10 HCC patients with liver cirrhosis were selected. A gadoxetate disodium enhanced hepatic MRI (EOB-MRI), performed before SBRT planning, showed that the functional liver imaging based on liver-spleen contract ratio (LSC) is the threshold ≥ 1.5 during the hepatobiliary phase.

Two respiratory-gated radiotherapy plans (48Gy/4fr) were designed and compared in for each patient as follows: 1) Plan A; anatomical IMRT plan based on the total liver; 2) Plan F; functional IMRT plan based on the functional liver.

Dosimetric parameters that percentage of total or functional liver volume irradiated with 5-30Gy [V5, fV5 V10, fV10, V15, fV15, V20, fV20, V30, fV30], mean dose of total or functional liver [MLD, fMLD] percentage of PTV volume received 95% of 48Gy (D95) and PTV mean dose, Monitor units (MU) for each plan of two plans were compared in terms of avoidance of normal liver.

Results: The dosimeteric parameters which PTV D95 (mean, Plan A and Plan F: 48.0Gy, p=0.84); monitor units (mean, Plan A: 2888 and Plan F: 3060, p=0.08) were no significant different in between two plans. Compared with Plan A, Plan F reduced MLD (mean, Plan A: 6.6Gy and Plan F: 6.3Gy, p=0.00002) and fMLD (mean, Plan A: 4.7Gy and Plan F: 4.2Gy, p=0.01). Furthermore upon comparison of the two IMRT plan, Plan F reduced total liver V10 / V15 / V20 (mean, Plan A: 23% and Plan F: 20.7%, p=0.0001 / Plan A:14.1% and Plan F:12.2%, p=0.004 / Plan A:8.5% and Plan F: 8.1%, p=0.03) and functional liver fV10 / fV15 (mean, Plan A:18.5% and Plan F:14.6%, p=0.01 / Plan A:8.4% and Plan F:5.1%, p=0.007) , with a small reductions in total V5 / V30 (mean, Plan A:35.3% and Plan F:34.5%, p=0.13 / Plan A:4.5% and Plan F:4.4%, p=0.08) and functional liver fV5 / fV20 / fV30 (mean, Plan A: 33% and Plan F:31.3%, p=0.164 / Plan A:2.5% and Plan F:1.7%, p=0.07 / Plan A:0.06%, and Plan F:0.07%, p=0.83) compared with Plan A. Statistically significant reductions in total and functional liver V10/V15/V20, fV10/fV15, MLD and fMLD were achieved in the functional image-guided IMRT plan.

Conclusions: Functional image-guided IMRT planning based on EOB-MRI appears to be effective in preserving functional liver in liver cancer patients with liver cirrhosis.

About the “Short Field Visit” at FUKUSHIMA

Group 1

○PHAM THI BINH TRANG
○DO XUAN BIEN
ROYBA EKATERINA
NGUYEN TAT THANH
OOKI　KURIHARA

Group 2

○NGUYEN THANH HAI
○HO MINH VAN
LIN YEN HWA
SHARIFAH NABIHAH SYED OTHMAN
TSUJIMOTO MASAYA
FUMIE YAMAGUCHI

Map
of
Hiroshima City
and
Symposium Floor

Map of Hiroshima central part

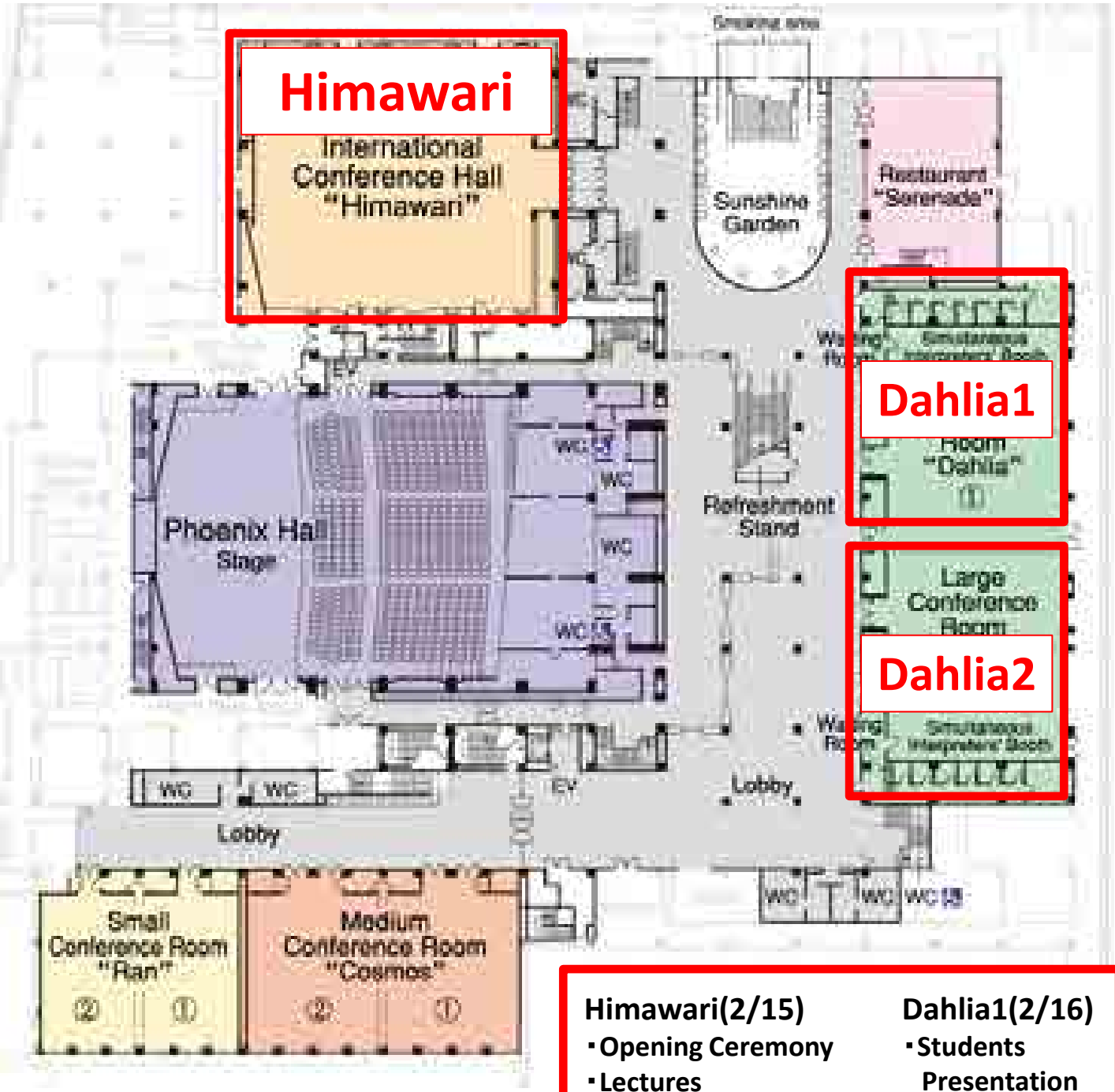
① Hiroshima Station

② International Conference Center Hiroshima
This symposium venue

③ Hiroshima Peace Memorial Museum

④ Peace Memorial Park

International Conference Center Hiroshima
Floor Guide of second basement (B2F)



Himawari(2/15)
- Opening Ceremony
- Lectures

Dahlia1(2/16)
- Students Presentation
- Reception

Dahlia2(2/16)
- Poster Session

Organizing committee

Director, Organization of the Leading Graduate Education Program
Toshimasa Asahara (President, Hiroshima University)

Program Director, Phoenix Leader Education Program (Hiroshima Initiative) for Renaissance from Radiation Disaster
Tetsuji Okamoto (Executive and Vice President, Hiroshima University)

International Exchange Board

Koichi Tanigawa, Chairman of Board
(Professor, Graduate School of Biomedical & Health Sciences, Hiroshima University)

Shoken Miyama
(Research Professor, Resident's Room, Hiroshima University)

Satoshi Tashiro
(Professor, Research Institute for Radiation Biology and Medicine)

Yasumasa Ohtsuka
(Associate Professor, Graduate School of Education)

Hironori Deguchi
(Professor (Special Appointment), Graduate School of Science)

Shuji Takahashi
(Associate Professor (Special Appointment), Graduate School of Science)

HIROSHIMA UNIVERSITY

【お問い合わせ先　Inquiry】

広島大学大学院リーディングプログラム機構
教育・国際室コラボレーションオフィス
フェニックスリーダー育成プログラム事務室
〒739-8524　広島県東広島市鏡山 1-1-1　/　Tel: 082-424-4689

The Organization of Leading Program, Hiroshima University
Collaboration Office of Education and International Office
Phoenix Leader Education program Office
1-1-1 Kagamiyama, Higashi-Hiroshima 739-8524 Japan　/　Tel: +81-82-424-4689

E-mail: phoenix-program@office.hiroshima-u.ac.jp
URL: http://www.hiroshima-u.ac.jp/lp/program/ra/