ARADOS: Asian Radiation Dosimetry Group

VIRTUAL TECHNICAL MEETING ON THE ASSESSMENT AND EVALUATION OF THE OCCUPATIONAL RADIATION PROTECTION APPRAISAL SERVICE (ORPAS)
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What is ARADOS?

- Asian Radiation Dosimetry Group (ARADOS) is a voluntary network on radiation dosimetry among Asian Countries.
- The network was founded in 2015 by three institutes,
  – Korea Institute of Radiological and Medical Science (KIRAMS)
  – China Institute of Radiological Protection (CIRP)
  – National Institutes for Quantum and Radiological Science and Technology (QST), Japan.
- The three leading countries have organized annual meeting to exchange information on activities of participating institutes and promote collaborative studies. So far, about 20 institutes joined the past annual meeting and/or collaborative exercises by ARADOS.

Dr. Wi-Ho Ha of KIRAMS (currently, KAERI) proposed the concept of ARADOS.
Motivations

- To enhance and harmonize radiation dosimetry capabilities in Asian countries
- To exchange research activities on radiation dosimetry of each institute
- To prepare the joint response for radiation dosimetry service in radiological/nuclear accidents

- The 2011 Fukushima Daiichi Nuclear Power Plant accident gave a significant impact to Asian countries.
- East Asia is the most dense NPP area in the world.
Structure of ARADOS

Chairperson
(O. Kurihara, QST)

Secretary
(S. Yoon, KIRAMS)

Host institute(s) of AM

Annual Meeting (AM)

Participants

WG1
Internal Dosimetry

WG2
External Dosimetry

WG3
Bioosimetry

WG4
Computational Dosimetry

Each working group (WG) has three coordinators from South Korea, China and Japan.

Coordinator meeting in the 5th ARADOS
Past ARADOS annual meetings

2015: Kick-off meeting hosted by KIRAMS (Korea)

2016: 2nd annual meeting hosted by CIRP (China)

2017: 3rd annual meeting hosted by QST (Japan)

2018: 5th annual meeting hosted by NIRP and CIRP (China)

2019: 4th annual meeting hosted by KIRAMS and KHNP (Korea)

2020: WG meeting (online)
Day 1
Opening Remarks: Osamu Kurihara (QST-NIRS)
Welcome Address: Young Woo Jin (KIRAMS)
Introduction of Participants: All participants

Section 1 (WG1: Internal Dosimetry)
- (Invited Talk) Phantom Study Considering Different Size of the Human Body and Organ for Internal Dosimetry: David Broggi (IRSN)
- A Reliable and Robust Method for Monitoring Large Populations to Assess Thyroid Internal Exposure from Radioiodine in a Nuclear Accident: A Proposal Based on Experiences of Fukushima: Kazuaki Yajima (QST-NIRS)
- Personalized Internal Dose Assessment for Radioiodine: Tae-Eun Kwon (KIRAMS)
- Conceptual Design of a Portable Thyroid Dose Monitoring System Using Gamma-ray Spectrometer: Yoshihiko Tanimura (JAEA)
- Dose Assessment for Workers Involved in an Internal Contamination Accident with Pu Compounds at JAEAs Oarai R&D Institute: Eunjoo Kim (QST-NIRS)

Section 2 (WG2: External Dosimetry)
- Retrospective Dosimetry Using Thermoluminescence and Optically Stimulated Luminescence: Jungil Lee (KAERI)
- The First EPR/Alanine Dosimetry Intercomparison Exercise in Korea: Byeong Ryong Park (KIRAMS)
- EPR/Fingernail Dosimetry for Accidental Exposure: Hiroshi Yasuda (Hiroshima Univ.)

Section 3 (WG3: Biological Dosimetry)
- (Invited Talk) Biological Dosimetry: Recent Developments in RENEB and at BfS: David Endesfelder (BfS)
- Biodosimetry Network Activities in Japan: Yumiko Suto (QST-NIRS)
- Biodosimetry Network in China: Jianxiang Liu (NIFP)
- Intercomparison of Dicentric Chromosome Assay (DCA) between KIRAMS and Health Canada: Younghyun Lee (KIRAMS)
- Monitoring Radiation Workers: The Comparison between Dicentric Chromosomes Assay and Cytokinesis-Block Micronucleus Assay: Pham Ngoc Duy (NRI, Vietnam)
Day 1 (continued)

Section 4 (WG4: Computational Dosimetry)
- (Invited Talk) ICRP Mesh-type Reference Computational Phantoms (MRCP): Chan Hyeong Kim (Hanyang University)
- EURADOS Intercomparison on ICRP Voxel-type Reference Computational Phantom: Han Sung Kim (KIRAMS)
- The Method of Accident Exposed Dose Reconstruction Based on MC Method: Qinjian Cao (CIRP)
- A Simulation Approach Using the Mesh Phantom to Evaluate the Effective Dose from Mobile Phone Glasses: Min Chae Kim (KAERI)

Discussions: All participants

Day 2
- Invited Talk by David Broggio (IRSN)
- Invited Talk by David Endesfelder (BfS)
- Discussion on the progress of the intercomparison exercise and future plan: All participants
- Presentation of WG Meeting Results: All participants
- Closing Remark of the 4th ARADOS Meeting: Osamu Kurihara (QST-NIRS)
- Announcement of Next ARADOS Meeting: Qinjian Cao (CIRP)

Day 3 Technical tour (KHNP/RHI, KNHP, KAERI)
Outcome of the past annual meetings

1st (kick-off) meeting (2015): hosted by KIRAMS
- Dr. Wi-Ho HA (KIRAMS) proposed a concept of ARADOS.
- Main missions of ARADOS were discussed among delegates of Korea, China and Japan.
- Hosting institutes of each country for annual meetings were decided.

2nd annual meeting (2016): hosted by CIRP
- The structure of ARADOS was discussed among participants.
- The chairperson and secretary of ARADOS were elected.
- Collaborative projects were discussed and launched.

3rd annual meeting (2017): hosted by QST
- The results of collaborative study projects (WG1: direct thyroid measurements, WG3: biodosimetry) were discussed.

4th annual meeting (2018): hosted by KIRAMS and KHNP/RHI
- Two international researchers were invited to give special talks.
- The result of WG3 (the second round) were discussed.

5th annual meeting (2019): hosted by NIRP and CIRP
- Nominating each WG leading coordinators from each country (Korea, China and Japan)
- Future collaboration with other Asian countries (e.g., ASEAN countries) was discussed.
Collaborative activity of WG1: Internal Dosimetry

Harmonizing direct thyroid measurements

- The exercise was conducted using ANSI-type neck phantoms; the source activity was blind to participants.
- The organizers prepared the test materials (phantoms and sources) and delivered them to the participants.
- The participants were requested to submit their measurement results.

Preparation of the phantoms and the sources ($^{131}$I)

Collaborative activity of WG3: Biodosimetry

Harmonizing chromosome analysis

- Metaphase images of the unknown dose were delivered to each participant from the coordinating institute.
- The participants analyzed the images and performed the dose estimation using their own calibration curve.

The 2018 intercomparison exercise was organized by NIRP.

The results of the 2017 intercomparison exercise on the DCA analysis. The reference dose was 3.9 Gy.

**Action plans of WGs**

**WG1 (internal dosimetry)**
- Intercomparison exercises: direct measurements (e.g., thyroid, WBC), bioassay, scenario-based internal dose assessment, etc.
  - Need to consider a solution for the international transportation of radioactive sources
  - Alternative items such as commercial samples (e.g., PROCORAD, IAEA, …) for bioassay, computational calibration for direct measurements

**WG2 (external dosimetry)**
- Harmonization of the dosimetry service in Korea, China and Japan (potentially other countries): $H_p(3)$ and $H_p(0.07)$ measurements
- Intercomparison exercise of the retrospective dosimetry (e.g., ERR, TL/OSL, …)

**WG3 (biodosimetry)**
- Further harmonization on the biodosimetry: scoring criteria, the selection of metaphases, …
- Collaboration with other international network (e.g., RENAB, LBDNet, …)

**WG4 (computational dosimetry)**
- Dose calculation exercises using ICRP’s reference voxel phantoms (Chinese, Korean, and Japanese reference phantoms are also available)
Future collaboration with ASEAN countries

Regional Training Course on Rapid Radiation Measurement and Individual Dose Assessment following Nuclear & Radiological Emergency at Office of Atoms for Peace in Bangkok, Thailand from Oct. 7-11, 2019. (Coordinated by IAEA RCA/RCARO)

Summary and remark

- ARADOS was established with aim of being a platform for a radiation dosimetry network among Asian counties. The past annual meetings provided valuable occasions to share information on research activities of ARADOS members with all participants.

- The inter-laboratory exercises (WG1 and WG3) were surely effective to harmonize and improve the relevant techniques of the participants. On the other hand, several difficulties were also found to organize such activities (e.g., costs, regulations of each country, …)

- The role of the founder institutes of ARADOS is very important in the next decades. A strong driving force is necessary to move ARADOS to the next step.
QST International Symposium

Objective
➢ The symposium will provide participants with opportunities to share the latest information on emergency response and preparedness (EPR) for major RN accidents in different countries, exchange their experiences and discuss the relevant issues.

Dates
➢ 21-22 September 2021

Venue
➢ Delivered online

If you are interested, please make your registration from the webpage.
1. Search “QST Japan” on the Internet (https://www.qst.go.jp/site/qst-english/)
2. You will find the link of the symposium on the top page of QST
3. Please find the registration (the online entry form).