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D7.8 – 2nd Report on E&T activities such as student placement, courses seminars, workshops, etc. in RTD Call 2

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Abstract

One of the aims of the first transnational call for proposals on “Radiation Protection Research in Europe” through the EJP CONCERT was to actively integrate E&T activities and collaboration with universities in multidisciplinary research projects. The six projects – ENGAGE, LEU-TRACK, PODIUM, SEPARATE, VERIDIC and SHAMISEN SINGS – supported in the call started their work at the end of 2017. One of their aims was to initiate an efficient education and training program on the field of their specific scopes. These E&T programs have promisingly started and are expected to achieve their aims until the end of the CONCERT project.

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Introduction

The second transnational call for proposals on “Radiation Protection Research in Europe” through the EJP CONCERT was issued in 2017. The aims of the call were:

- To support transnational research projects that combine innovative approaches in the field of radiation protection in line with the research priorities of CONCERT;
- To actively integrate E&T activities and collaboration with universities in multidisciplinary research projects;
- To make optimal use of research infrastructures.

As the outcome of the call six projects were supported. These are:

- **ENGAGE** - ENhancinG stAkeholder participation in the GovernancE of radiological risks for improved radiation protection and informed decision-making
- **LEU-TRACK** - The Role of Extracellular Vesicles in Modulating the Risk of Low Dose Radiation-induced Leukaemia
- **PODIUM** - Personal Online Dosimetry Using computational Methods
- **SEPARATE** - Systemic Effects of Partial-body Exposure to Low Radiation Doses
- **VERIDIC** - Validation and Estimation of Radiation skIn Dose in Interventional Cardiology
- **SHAMISEN SINGS** - Stakeholder INvolvement in Generating Science after Nuclear Emergencies

ENGAGE project aims at developing theory, practice and guidelines for stakeholder engagement in relation to medical exposures to ionizing radiation, post-accident exposures, and exposure to indoor radon. ENGAGE project objectives are to i) answer the questions why, when and how are stakeholders engaged in radiation protection issues; ii) develop novel approaches to analyzing stakeholder interaction and engagement; iii) investigate processes for enhancing radiation protection culture and their role in facilitating stakeholder engagement; and iv) provide recommendations and building a knowledge base for stakeholder engagement in radiation protection.

The goal of **LEU-TRACK** is to study basic mechanisms leading to low dose radiation-induced carcinogenesis and evaluation of health risks attributable to low dose exposures represent key research priorities in low dose radiation research. In line with these priorities, the LEU-TRACK project proposes to study basic mechanisms in low dose radiation-induced leukaemia by focusing on the role of crosstalk between the bone marrow microenvironment and the stem cell compartment in initiating the leukemic process. While radiation-induced direct damage to the haematopoietic stem cell pool is suggested to be the major driver in the development of the disease after higher doses, radiation-induced leukaemia at low doses most probably involves additional mechanisms distinct from those at high doses. Extracellular vesicles (EVs) are major vehicles of intercellular communication due to their complex cargo. The proposal aims to investigate mechanisms and pathways how bone marrow-derived EVs, by influencing the communication between the different cellular components can induce bone marrow damage and thus modulate low dose radiation-induced leukaemia. In order to correlate blood-derived EV markers identified in experimental animals with markers present in human leukaemia patients, a small pilot study, analysing blood-derived EV cargo from leukaemia patients subjected to prophylactic brain irradiation will also be carried out.

PODIUM is a research project to improve occupational dosimetry by an innovative approach: the development of an online dosimetry application based on computer simulations, which will calculate individually the occupational doses, without the use of physical dosimeters.

SEPARATE aims to study the contribution of systemic “out-of-target” effects to the risks of a long-term health detriment following exposure to radiation. Contributors to the project analyze the effects on brain, heart, and liver, following exposures of the lower third of the body, whilst the target organs are shielded.

VERIDIC tries to define the standards for digital dose reporting: Development and testing of acceptance and QC protocols for skin dose calculation software; Comparison of software performances; Optimisation of radiation protection of patients.

SHAMISEN-SINGS brings together an experienced multi-disciplinary and multi-national consortium to answer important objectives of the call: to improve countermeasures for nuclear emergency preparedness and provide important knowledge on stakeholder engagement in radiation protection, including a critical assessment of benefits and challenges of citizen science. By taking a practical ethics approach, fostering co-reflection between natural and social scientists, it will strengthen integration of social science in radiation protection. It will also provide an independent channel for collection and management of data for use by authorities for decision making, assessment of doses, evaluation of health/social condition and health surveillance in general, and support in the implementation of BSS.

The scope of the current deliverable is to report on E&T activities of the ENGAGE, LEU-TRACK, PODIUM, SEPARATE, VERIDIC and SHAMISEN SINGS projects.

Achievements

Education and Training within the ENGAGE Project

ENGAGE contributed to improving radiation protection culture and the governance of radiological risks towards enhanced stakeholders’ engagement and informed decision-making, in different exposure situations. In this context, education and training (E&T) was a key element in order to strengthen the methods and to increase the findings of this research, and to promote the radiation protection culture in the new generations.

Transdisciplinary approaches to the governance of radiological risk have been stimulated by integrating E&T into the research program with:

- Engagement in the research activities of ENGAGE of Master students and PhD students, in both social sciences and natural sciences.

1) In the former case, stakeholder engagement in ionizing radiation exposure situations provided case studies for sociological research. A **special session dedicated to Stakeholder Engagement at RICOMET 2018** took place in June 11-15, 2018 in Antwerp, Belgium. RICOMET is a series of multi-disciplinary conferences dedicated to Social Sciences and Humanities research related to ionizing radiation. More information about that event and outputs can be found at the RICOMET 2018 website.

The ENGAGE project hosted a special session within the RICOMET 2018 conference, entitled: “Involve, Engage, or Participate? Shaping Engagement with Stakeholders and Wider Publics in Radiation Protection”. Several presentations related to ENGAGE project were given, such as:

- Reconceptualizing stakeholder participation in Emergency Preparedness and Response
- Stakeholder engagement in radiation protection – what can we learn from practice?

- Saving and sharing knowledge on stakeholder engagement in radiation protection - challenge for knowledge base development

2) In the latter case, stakeholder involvement processes have been an important addition to the education and training of students and practitioners, through testing the benefits of effective stakeholder engagement and the importance of a functioning RP culture. In that context a **Workshop on the Development of Radiological Protection Culture to Support the Governance of Radiological Risk (ENGAGE WP3)** took place in February 13-15, 2019 in Athens, Greece. The workshop gathered around 50 persons, from ENGAGE partners as well as invited stakeholders. The objectives were to share the results of the case studies developed in the WP3 and to initiate the elaboration of guidelines/recommendations for the building of radiological protection culture in view of improving stakeholder engagement in the governance of radiological risk. The deliverable D. 9.84 - WP3 Workshop has been approved by CONCERT project and provide more information on workshop information and outputs;

- Involvement of the departments in the academic faculties (medicine, physics), through the direct contacts with the personnel participating to the ENGAGE project:

- by supporting the introduction and discussion in the academic environment of parts of the case studies produced and analyzed in the project (e.g; at SCK•CEN -, in the field of emergency preparedness and response);
- by organizing seminars on the ENGAGE guidelines/recommendations for building radiation protection culture in universities selected by the project partners (e.g. in universities which are partner of the project);
- by promoting, where applicable, the inclusion of the results of ENGAGE project, as part of already existing and offered courses.

ENGAGE project was presented at the following **local stakeholders workshops and training courses**:

- 27 of June 2018, at CIEMAT, Madrid, WP4 CONFIDENCE workshop - a part of presentation, there was a group discussion also (for WP2 ENGAGE case study, Spain)
- 21st of September 2018, Madrid, UPM: Local (Spanish) Stakeholders' workshop, where ENGAGE was presented followed by a group discussion on the relevant questions of ENGAGE WP2 Case studies
- Workshop on EC REM 2018: Radon-in-Water Proficiency Test & Training course on the measurement of radon and radioactivity in water. 26th – 29th March 2019. JRC-Geel, Belgium with introduction of the “Radon communication: state-of-the-art and good practices” by T. Perko, SCK/CEN;

- Inclusion of project findings in established courses and workshops in radiation protection (e.g. EUTERP network, NERIS Platform and CONCERT courses on emergency preparedness and post-accident recovery) took place at following occasions:

ENGAGE contributions at **4th NERIS workshop** which took place in April 25-27, 2018 in Dublin, Ireland. ENGAGE researchers presented the project and engaged with researchers and practitioners in the field on nuclear and radiological emergency management and discussed expectations from and challenges related to stakeholder engagement. Several presentations related to ENGAGE project were given, such as:

- Engaging stakeholders in the governance of radiological risk: Developing theory, practice and guidelines
- Knowledge base for stakeholder engagement in radiation protection
- Stakeholder Engagement in Emergency Preparedness and Response

ENGAGE at **3rd European Radiological Protection Research Week** in Rovinj, Croatia, 1-5 October 2018 with several activities:

- Stakeholder engagement for medical exposures and exposures to indoor radon with reports:
 - Round table on stakeholder engagement in relation to medical exposures to ionizing radiation
 - Round table on stakeholder engagement in relation to radon exposures
- “Imagining engagement” - a hands-on experiment with stakeholder engagement: a participatory mapping exercise where conference attendees write and draw their thoughts about stakeholder engagement in radiation protection with follow-up facilitated discussion.

ENGAGE at **5th NERIS Workshop** which took place in 3-5 April 2019 in Roskilde, Denmark with following presentations:

- Formal and informal participation in Emergency Preparedness and Response - A purposeful mapping exercise
- RP Culture in the Field of Emergency - Preparedness and Response: First Outcomes from the European Project ENGAGE.
- Through the **case studies in WP2 and WP3** various stakeholder groups (regulatory bodies, local municipalities, radiation protection experts and civil society organizations) have been involved. This enabled to share and communicate the findings due course of the project. The analysis of stakeholder engagement and the importance of radiation protection culture formed the basis for raising awareness among radiation protections experts and professionals.

The **ENGAGE final workshop** scheduled on September 11-13, 2019 to take place in Bratislava, Slovak Republic will have a dissemination and educational purpose and will consist of presentations, panels and facilitated group discussions. The workshop will involve a wide spectrum of participants and include two-way communication of project results. The announcements (First and Second) have been already issued and registration and programme development is ongoing.

All ENGAGE deliverables, information and news are available at the ENGAGE Project web page (page <http://www.engage-concert.eu/>) as well as on the CONCERT website.

Education and Training within the LEU-TRACK Project

At the suggestion of LEU-TRACK a Students day section was organized during the 3rd RPW meeting in Rovinj, 1-5 October 2018. Katalin Lumniczky and Soile Tapio chaired the session. Four PhD students or postdocs from LEU-TRACK partners (Nikolett Sándor, Eric Rutten, Prabal Subedi and Dávid Kis) presented their work in the form of oral presentations. The session offered an occasion for all young scientists participating in CONCERT research projects to present their data. It also offered possibility for young scientists not involved in CONCERT to introduce their work. Overall, 14 oral presentations were given.

- A training course entitled “Essentials of Radiation Leukemogenesis” will be organised by LEU-TRACK on 4-7 November 2019. It will be hosted by PHE and will consist of lectures and practical demonstrations in the topic. The course will be open for CONCERT and MELODI members and will be limited to 12 participants.
- Eric Rutten, PhD student (PHE) and Amir Mofidi, postdoc (GUF) visited OKI to learn EV isolation protocols as well as EV phenotyping by flow cytometry.
- Dávid Kis has successfully performed his thesis for the master’s degree with the title: “Radiation-induced bystander effects mediated by extracellular vesicles” at the Pázmány Péter Catholic University Budapest – Faculty of Information Technology and Bionics – Medical Biotechnology master program
- Anna Balogh and Béla Huszák have successfully performed their thesis for master’s degree with the title: “Biological effects of low dose ionizing radiation – the role of extracellular vesicles” at Semmelweis University, Faculty of Health Sciences.
- Dávid Kis has successfully applied for a PhD grant at the Semmelweis University, Budapest, Károly Rácz School of PhD – Pathological Sciences – Experimental Oncology Program and will start his PhD studies in February 2019. The title of his PhD project is: The role of EVs in radiation-induced bystander and systemic effects.
- Dávid Kis has successfully applied for a young investigator travel award at the European Radiation Research Society and presented his data in the form of a poster at the ERR meeting organized in Pécs, Hungary, August 21-25, 2018.
- Dávid Kis received a young investigator travel award from CONCERT and presented his data during the 3rd RPW meeting in Rovinj, 1-5 October 2018.

Education and Training within the PODIUM Project

PODIUM project, as an innovative methodology in the field of personal dosimetry, includes several activities in the section of Education & Training (E&T).

Firstly, since the proposed activities will be performed in close collaboration with academic institutions, one PhD is in progress. The subject of the PhD is “Personal Dosimetry of Workers without a physical dosimeter: An innovative application using Computational Methods” and is focused on computational dosimetry through motion tracking, Monte Carlo calculations and use of realistic anthropomorphic flexible phantoms (computational phantoms).

Within the framework of the project another activity is the preparation and conduct of a workshop to present the online dosimetry application based on computer simulations without the use of physical dosimeters. The availability of advanced online dosimetry applications such as these in the radiation protection field will increase awareness among workers and improve the implementation of the ALARA principle.

As such, the project partners decided to come into contact with the European ALARA Network (EAN) and organize a joint workshop to present the PODIUM results, innovative ALARA tools and discuss broadly their use in advancing radiation protection and ALARA.

The workshop will be held in Athens, Greece, from 26th to 29th of November 2019, hosted by the Greek Atomic Energy Commission. The first day of the joint workshop (26th November 2019) will be dedicated to presenting the main results of PODIUM, while the next days (27th – 29th November 2019) will be dedicated to the EAN workshop on innovative ALARA tools.

The thematic areas of the workshop will cover the general outline of optimization in occupational exposure in interventional radiology and mixed neutron /gamma workplaces. During the workshop, emphasis will also be given on how the ALARA principle can be used effectively by real-time dose results.

Education and Training within the SEPARATE Project

The SEPARATE project (Partners: ENEA, HMGU, OBU, TU Dublin) is committed to E&T activities and supports initiatives for students, including participation in at least one national and one international conference where they can present project data. A ‘Students day’ was organised during the RPW2018 meeting, and young researchers from the SEPARATE teams had the opportunity to present results of project activities. Similarly, students from partner institutes travelled to Rome for the Kick off meeting in March 2018, and to Dublin for the 1st SEPARATE Annual Meeting in December 2018, and took active part in discussions and planning of project activities, in addition to giving formal presentations of their results. Initiatives for students’ support were shared by all partners.

As for collaboration with academic departments, ENEA collaborates with the University of Pavia (UNIPV) on integrative bioinformatics analysis of SEPARATE omics data sets, which is crucial to uncover the pathways affected in the out-of-target and exposed tissues to identify potential biological mechanisms and biomarkers of TB and PB exposures. At OBU, lectures to undergraduate and MSc students have been given by Prof. Kadhim to illustrate the SEPARATE project’s activities.

All partners have submitted abstracts for the ICRR 2019 conference in Manchester, 25 - 29 August 2019 (total of 8), the vast majority of which have young researchers as first authors and presenters.

Junior staff will also be invited to attend and present their results at the ICRR 2019 Satellite Meeting on Radiation-induced changes in exosomes.

OBU also plans to submit scientific abstracts from SEPARATE project results for the 65th Annual Radiation Research meeting in San Diego, California, 3-6 November 2019, with junior scientists as speakers. Similar actions will be supported by all partners at the ERPW 2019 in Stockholm.

Education and Training within the VERIDIC Project

A MSc student internship was done on the assessment of the accuracy of a skin dose calculation software system at HUG/CHUV in the frame of the project; the student is still participating in the project data collection as a young professional.

A recently graduated engineer started at APHP and is involved in the analysis of the procedure data collected in the participating hospitals.

A MSc student at University of Belgrade, Belgrade, Serbia (VINCA) has developed 2D skin dos mapping application, based on the data collected during VERIDIC project. He has continued to work on the improvement of the application as a part of his PhD project.

Education and Training within the SHAMISEN SINGS Project

- **1 post-doc student for SHAMISEN SINGS project (ISGlobal, Barcelona, Spain)**
- SHAMISEN SINGS projects – Use of Apps for dosimetry and health – **Lecture in a joint UPF-UAB Master course for Public health (ISGlobal, Barcelona, Spain)**
- **1 PhD student** formation (partly funded by Shamisen Sings) (NMBU, Oslo, Norway)
- **Discussing challenges with dosimetry** etc. in **two MSc courses given at NMBU**: KJM351 Radioecology and KJM310 Environmental Chemistry and Toxicology with reference to the project.
- **EURADOS exercise on 12 February 2019, Lodz, Poland**. Participants were asked to perform measurements with a mobile app using their own smartphones. Two sessions of measurements were performed, followed by discussion and exchange of participants' opinions on their experience. The participants were also asked to fill the Shamisen-Sings survey (**responsible ISS, Rome, Italy**).
- **Lecture on Citizen participation in R/N emergencies through novel tools and mobile APPs** (ISS, Rome) during the **International Master courses** in "Protection Against CBRNe Events", *University of Rome Tor Vergata*, Module 6 - "Management of Nuclear Events and Radiological Scenarios", 18 June 2018 (**responsible ISS, Rome, Italy**).

Conclusions

The six projects – ENGAGE, LEU-TRACK, PODIUM, SEPARATE, VERIDIC and SHAMISEN SINGS – supported in the 2nd transnational call for proposals on "Radiation Protection Research in Europe" through the EJP CONCERT started they work basically at the end of 2017. One of their specific aims was to initiate an efficient education and training program on the field of their specific scopes. These E&T program have promisingly started and are expected to achieve their aims until the end of the CONCERT project.