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D 9.11 - Report on a workshop for integration of biodosimetry into emergency response

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Abstract

Biological dosimetry enables individual dose reconstruction in the case of unclear or inconsistent radiation exposure situations, especially when a direct measurement of ionising radiation is not or is no longer possible. To be prepared for large scale radiological incidents, networking between well trained laboratories has been identified as a useful approach to provide fast and trustworthy dose assessments needed in such circumstances. As a consequence, the RENEB network was established with the support from the European Commission (EURATOM, FP7, GA. 295513). In 2016, this European network was based on a Memorandum of Understanding, signed by 29 organisations from 16 European countries. To make the network self-contained and effective, the legal association RENEB e.V. was set up in 2017 as a core structure to perform regular exercises, to care for Quality Assurance and to link the network to the national and international emergency preparedness and response structure. In the CONFIDENCE workshop, the current concepts of biological dosimetry have been discussed, critical points have been identified as well as strategies how to integrate and consolidate existing biodosimetry and retrospective physical dosimetry infrastructures in the existing emergency preparedness and response structure

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1 Workshop for integration of biodosimetry into emergency response

Existing concepts of biological dosimetry have been discussed in a workshop and options have been identified how to integrate and/or consolidate existing biodosimetry and retrospective physical dosimetry infrastructures in the existing emergency preparedness and response structure. It was stated, that in Europe the MULTIBIODOSE Guidance and the RENEB network provide a solid and up to date foundation for individual retrospective dose estimation in case of medium and larger scale radiological occurrences. This is assured by the fact, that many of the RENEB partners belong to national agencies or organisations, which are involved in or responsible for the national emergency preparedness and response (EPR). Most of these organisations are also connected to international bodies of emergency preparedness and response, e.g. IAEA RANET, WHO REMPAN, GHSI, which also confirm the need for biodosimetry and EPR/OSL dosimetry. The RENEB Network as such holds close contact with these international emergency preparedness and response organisations as well as with biodosimetry networks beyond Europe, e.g. in North America, Latin America and Asia. With regard to technical further development of assays, RENEB interacts with the EURADOS Platform, especially WG10 “Retrospective dosimetry”.

For the sustainability and preparedness of the RENEB network and its sustainable integration in national and international emergency management and response system, continuous effort at different levels is needed: 1) Defined communication structure within the network and outward, 2) Efficient and professional collection and shipment of the biological and inert samples, 3) Coordinated and quality assured sample processing and analysis in the partner laboratories, 4) Harmonised, quality assured dose estimation using robust, suitable software tools, and 5) Up-to-date contact details from relevant national and international authorities, emergency preparedness and response units and from all network partners, 6) Testing and if justified integration of new techniques and approaches 7) Constant distribution of knowledge about the capabilities and capacities of biological and retrospective physical dosimetry.

These conditions have to be checked and practiced by all network partners on a regular basis. Examples for promising and/or successful approaches for the integration of biodosimetry and RENEB in emergency response are for example the organisation of regular intercomparisons for different radiation scenarios with invitation to EPR organisations to join the exercises, the harmonisation of dose estimation by the development of open access online software tools and the inclusion of biodosimetry and RENEB in official EPR exercises, e.g. CONVEX exercises 2018 and 2019.

2 MULTIBIODOSE Guidance

The MULTIBIODOSE (MBD) consortium developed and validated several biodosimetry assays and adapted and tested them as tools for biological and retrospective physical dose assessment in a mass-casualty event. In an emergency situation, a MBD laboratory in the affected country (or another national laboratory designated to perform biodosimetry) will act as the ‘core’ or ‘administrative’ laboratory. This laboratory will be in charge of the decision regarding which assays should be used and how other laboratories can be involved. The laboratory will give advice to the health and radiation protection authorities about the collection of samples, will collect the results from other MBD laboratories and finally will apply the MBD guidance and, as far as possible the MBD software for the whole spectrum of applied MBD assays. In the end, this laboratory will provide the health and radiation protection authorities with diametric and radiological triage categorisation results to support medical and public health decisions. In case the local laboratory is not able to take such decisions or a local laboratory does not exist, this task can be transferred to a RENEB partner laboratory. The basic procedure in case of an emergency are described in the MULTIBIODOSE Guidance (Wojcik et al, 2014, Jaworska et al., 2015). When needed, the guidance will be updated and adapted.

3 RENEB Network

The RENEB network was established under EURATOM, FP7, (GA. 295513) to support emergency preparedness and response in radiological disasters (Kulka U & Wojcik A. 2017; Kulka U, Abend M, Ainsbury E et al. 2017; Lloyd D, Turai I, Voisin P. 2017). In case of such events, the RENEB network partners will provide mutual assistance in biological and retrospective physical dosimetry. The legal bond of RENEB is a Memorandum of Understanding (MoU), up to now signed by 29 organisations from 17 European countries. Most of these laboratories are involved in the national emergency preparedness and response and also active in international emergency and response preparedness organisations. To enhance the activity of the RENEB MoU-based network the registered RENEB association was established in 2017 (http://www.reneb.net/home/statutes/). The decision taking members of the association are institutions and organisations, many of them with the public order to perform individual dose estimation based on biological or EPR/OSL dosimetry in case of an unclear irradiation situation. Due to membership fees, paid by the decision taking members, the association has some financial resources to organise and run practical exercises and to support QA and QM measurements, e.g. by supporting the development of free software tools for dose estimation and uncertainty analysis and to organise meetings.

3.1 Network partners and their involvement in national and international emergency preparedness and response

Generally, the RENEB partners belong to national agencies or organisations, which are entrusted to perform biological and/or EPR/OSL dosimetry for their country and also for countries without such laboratory. Some of the RENEB partners are officially appointed in the national emergency plans to perform biological dosimetry: BfS (Germany), BIR (Germany), SERMAS, LAFE and UAB (Spain), PHE (United Kingdom), IRSN (France), OSSKI (Hungary; former NRIRR), and UGENT (Belgium). More numerous (15) are RENEB partners (BfS, BIR, CEA, SERMAS, PHE, IRSN, ISS, LAFE, NCRRP, OSSKI, NRPA, UGENT) that are integrated in the emergency response plan, obviously because either the RENEB partners are official governmental institutions destined to support the radiological emergency actions or they belong to the scientific institutes which are interested in acting in such emergency situation.

Many of the RENEB partner organisations are also connected to international bodies for emergency preparedness and response, e.g. IAEA (RANET), WHO (REMPAN, BioDoseNet) or to initiatives as GHSI (Global Health Security Initiative). These international organisations also confirm the need for biological and EPR/OSL dosimetry and in this regard welcome a dedicated network. The QA&QM applied in the RENEB network is publicly accessible (Gregoire E, Ainsbury L, Barrios L, et al. 2016) and open to other laboratories.

3.2 Connection of RENEB to international EPR organisations and BD-networks

Not only the partner organisations, also the RENEB association itself has established contact with the above mentioned international organisations WHO and IAEA. Close contact and joint activities have been performed with biodosimetry networks beyond Europe, e.g. from North America, Latin America and Asia, as well as with WHO BioDoseNet (Oestreicher U, Samaga D, Ainsbury E et al. 2017). In a joint publication, Biodosimetry and Biodosimetry networks for managing radiation emergency current networks were presented (Kulka U, Wojcik A, Di Giorgio M et al. 2018)
With regard to technical further development of assays, RENEB works closely together with the EURADOS Platform, especially WG10 “Retrospective dosimetry”. This implies the development of an easy applicable online software tool for robust dose estimation. The free availability of this tool will

significantly contribute to the harmonisation of individual retrospective dose calculations based on biological markers.

3.3 Ensuring continuity for the integration of biodosimetry into emergency response

Continuous effort is needed to keep the network up to date and beneficial for emergency preparedness and response. This includes the constant review and update of information:

- Overview of the lab capacities and information about the number of samples, that can be received and processed by a partner organisation
- The communication structure within the network and to the outside has to be checked and kept up to date. This includes, among others, the contact details from the network partners, from relevant emergency preparedness and response units and from national and international authorities.
- Material and instruction for sample taking (e.g. blood, mobile phones), labelling, transportation and distribution of the samples has to be at hand and ready to be distributed.
- Coordinated and quality assured sample processing and analysis in the partner laboratories has to be ensured.
- Harmonised, quality assured dose estimation in the partner laboratories has to be ensured.
- Reporting (information flow of results) and workflow of the documents must be ensured. Mandatory in this context is the system of SAMPLE CODING. This should preferably be consistent within the network.
- Distribution of knowledge about the capabilities and capacities of biological and retrospective physical dosimetry and the network has to be assured, within a country and beyond.

Besides activities, which are initiated and performed by RENEB, the inclusion of biodosimetry and RENEB in official exercises has to be considered. Such attempts were launched for the first time during CONVEX 2017 and 2018, when RENEB partners were contacted without prior warning and queried about their short-term availability and capacity for dose estimation. The feedback from the network partners was very encouraging and the results are currently compiled and evaluated. It is envisaged to check the described capacity of the laboratories in a practical exercise. This is mandatory to identify weak points in handling large numbers of samples and to further optimise the workflow in each laboratory and also in networking.

4 Conclusion

Within the MULTIBIODOSE project (Multi-disciplinary biodosimetric tools to manage high scale radiological casualties), a guidance document for radiation emergency response organisations in Europe was developed and within the RENEB project (Realizing the European Network of Biodosimetry), a European Network of biological and physical-retrospective dosimetry was established and subsequently consolidated as association. With its ready-to-use operational basis, its quality assurance, education, training concept, RENEB, and the MULTIBIODOSE guidance are able to contribute efficiently to emergency preparedness and response. However, it will need continuous efforts to consolidate networking and to keep the activities of the network partners up to date, efficient and ready. This does not only apply to practical approaches but also to the backup data.

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