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Abstract

Studies of human populations (for example, Atomic Bomb survivors, clinical staff, pilots and victims of the Chernobyl accident) have led to the conclusion that the lens of the eye is more sensitive to ionising radiation exposure than previously thought. Revised and substantially reduced dose limits were put into effect in Europe in early 2018. However, it is still very unclear how lower dose ionising radiation might cause or be involved in the development of cataracts. This is an important current public health issue, particularly for medical radiation workers, many of whom will need to amend their working practices despite a clear lack of understanding of the effects of chronic, lower dose, ionising radiation exposure on the lens.

The EU CONCERT funded 'LDLensRad' project aims to bring together experts from across Europe to answer a number of key research questions on the topic of radiation exposure of the lens, including the mechanisms of how low-medium dose radiation causes cataracts and how genetic background and age influences cataract development after radiation exposure. Outcomes are anticipated to include information regarding the shape of the dose response curve and thus the risk of radiation cataract at low doses (relevant for EU radiation workers), thus strengthening the evidence base for informed radiation protection.

Following a detailed programme of experimental set up and optimisation during year 1 of the project, data gathering continues in earnest. All experiments are proceeding as planned, and, indeed, some promising initial data are starting to emerge – with several presentations at international scientific conferences taking place during this period. The project teams are now beginning to consider the first publications. Importantly, the work planned to take place during year 3 will consolidate findings across the range of different experimental endpoints and, we predict, will enable concrete conclusions to be drawn.

This Deliverable summarises the input of the Advisory Board (AB) to the LDLensRad project during the 12-24 months period. AB members were present at the month 18 progress meeting, and provided comments and advice both in person and in writing to the project members. The contribution of the AB has clearly helped maintain the momentum and appropriate research directions, ultimately to ensure the quality of the projected outputs.

Overall, the LDLensRad project is progressing very well to date, and integration of the partners within the collaboration has been highly successful. It is anticipated that the proposed work plan will be completed as per the original schedule of milestones and deliverables, with no significant problems or delays.

Progress summary

The Advisory Board (AB) consists of five internationally recognised scientific experts:

- Nobuyuki Hamada from CRIEPI who advises on radiation biology and radiation protection aspects and experimental approach;
- Joseph Dynlacht from Indiana University School of Medicine who advises on lens biology and related experimental aspects;
- Lawrence Dauer from MSKCC who advises on medical radiation aspects, dosimetry issues, the interpretation of the results and wider implications,
- Tamara Azizova from SUBI who advises on epidemiological aspects, and
- Rick Tanner from PHE who advises on dosimetric and wider public health aspects.

In year 2, in addition to attending the planned progress meeting (details outlined below), the AB continued to have regular discussions among members or with Research Partners, wrote to Research Partners to share the latest scientific information relevant to the project, and contributed to the LDLensRad ResearchGate web page (https://www.researchgate.net/project/LDLensRad-the-European-CONCERT-project-starting-in-2017-Towards-a-full-mechanistic-understanding-of-low-dose-radiation-induced-cataracts) that is accessible to the public.
In year 3, these activities will continue to ensure active involvement of the AB in order to support progression towards the conclusion of the LDLensRad project.

Advisory Board contributions to the Annual Meeting, Munich, June 2018

Three of the five AB members (from UK, Japan and the Russian Federation) were able to attend in person. Over the first day and a half, they listened a series of presentations made by Research Partners regarding progress to date on the various work packages and tasks, and the associated discussions. On the afternoon of day 2, the AB held a two hour closed meeting to prepare their report in which several AB members participated by telephone. This was followed by a 30 min presentation to the Research Partners, during which the AB offered various comments and suggestions, as summarised below.
The consensus of the AB following this meeting was very positive: The AB in particular noted that people are paying attention to LDLensRad, but more partners should post on the ResearchGate site. The AB noted that useful data are already being generated, and that it would be good to pay attention to the mechanisms that will link the different endpoints together. The AB were also supportive of the idea to write a short publication focusing on the progressive nature of cataract and of detriment and risk. Although the AB is very supportive of the work under WP3 (Low-dose irradiation effects on brain and behaviour), they request that presenters be clearer about the link between this work and the lens aspects. The AB also recommend that the radiosensitivity of wider ocular structures be investigated in more detail. The AB strongly supports open data sharing, as previously proposed, and the dosimetry validation as presented by PHE. The AB also commented on the statistical aspects, specifically that a more coherent plan is needed; however, it has been noted that this is being developed as the data are emerging. Finally, presentation at as many meetings as possible was recommended, including ICRP 2019.

Conclusions

Through attendance of AB members at face-to-face meetings or through regular email contact, the AB have had detailed input into the LDLensRad project to date, and it is anticipated that this will continue going forward. Further, there is clear evidence that the involvement of the AB is helping to ensure the integrity and quality of the anticipated project outputs both in terms of understanding of mechanisms of radiation action in the lens and in support of more effective, evidence-based, radiation protection of the lens in future years.