

Regulatory implementation of the equivalent dose limit for the lens of the eye for occupational exposure

Successes and challenges to the approaches identified through a survey of regulators

Presented by Christina Dodkin

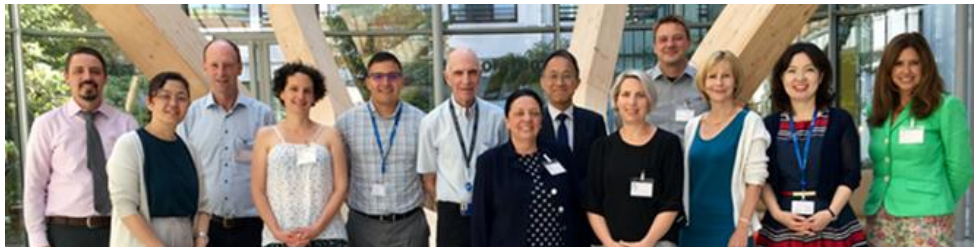
Chair of the NEA CRPPH EGDLE

Canadian Nuclear Safety Commission (CNSC), Canada

*NEA Web Event: Launch of the newly published NEA report
March 7, 2022*

Expert Group on the Dose Limit for the Lens of the Eye (EGDLE)

- In March 2019, the CRPPH created the Expert Group on the Dose Limit for the Lens of the Eye (EGDLE):
 - chaired by Christina Dodkin (Canada), with Vice-Chair Marie-Claire Cantone (Italy), NEA secretariat Jacqueline Garnier-Laplace and Jan-Hendrik Kruse
 - NEA member countries represented on the EGDLE also include: United States, Japan, Ireland, France, Germany, Spain, Argentina, Switzerland, and the United Kingdom
- Main objective of the EGDLE is to provide an opportunity for regulators and stakeholders to share lessons learned (both successes and challenges) in the practical implementation of the International Commission on Radiological Protection's (ICRP's) recommended equivalent dose limit for the lens of the eye for occupational exposures.



Mandate and Deliverables of the EGDLE

- A report which summarizes the practical experiences of regulators and stakeholders worldwide for implementing the ICRP's recommended equivalent dose limit for the lens of the eye for occupational exposure, including successes and challenges to the approaches.
- A network established to maintain dialogue and information exchange.

EGDLE Programme of Work

- To facilitate the development of the report, a survey was sent to NEA member countries, targeting regulators of nuclear, medical and non-nuclear applications.
- The survey included questions on:
 - current status of regulatory dose limits for lens of the eye
 - successes in stakeholder engagement, including approaches taken by regulators to ensure positive interactions with stakeholders
 - accreditation and approval processes for $H_p(3)$ dosimetry
 - challenges with the practical implementation of new dose limits and actions taken to address these challenges
- Official survey launched on March 3, 2020 and closed on July 31, 2020.

Overview of the EGDLE report

- A total of 24 organisations from 15 countries provided responses to the EGDLE survey:
 - responding organisations represented 18 regulatory bodies, 3 TSO, and 3 nuclear fuel cycle facility operators (in complement to that of the regulatory body)
 - majority (13) of respondent countries have a mix of nuclear, non-nuclear and medical applications
- Majority (13) of surveyed countries have/are revising legislation, with some countries adopting a single eye dose limit of 20 mSv/year, while another country adopting a single dose limit of 50 mSv/year.
- Stakeholder engagement regarding revisions to legislation occurred by all countries, and the level of engagement varied from publications to workshops, technical meetings and webinars.

EGDLE Report Summary (1)

- **Implementation challenges** amongst respondent countries are similar, and include:
 - **cost of demonstrating compliance with reduced lens of the eye dose limits**
 - difficulties and concerns over **accurate measurement of lens of eye doses**
 - increased requirements for **categorisation of radiation workers**
 - **availability of dosimetry**, including lack of approved eye lens dosimeters and/or no defined accreditation and technical requirements for eye lens dosimeters in particular
 - **ergonomic issues and concerns**, leading to reluctance of personnel to wear eye lens dosimeters or protective glasses
 - issues with **dosimeter placement** and use of **personal protective equipment**
 - **compliance issues**, including reluctance of workers to wear dosimeters close to the eye, inconsistent use of personal protective equipment, difficulties in verifying that dosimeters have been worn correctly, training and education, etc.
 - **lack of consistent guidance**, including from a regulatory perspective (for example, standardising dosimeter placement, use of surrogate dosimeters, use of correction factors, etc.)

EGDLE Report Summary (2)

- No clear consensus amongst countries regarding **demonstration of compliance** with lens of the eye dose limits:
 - not all regulators have stipulated when individual monitoring of the eye is required, and when specified, it is when lens of eye doses are projected to be at or greater than 15 mSv/year
- No consensus on **how protective equipment is accounted for**, and **how the dosimeter is worn with protective equipment such as eyewear** dosimeters:
 - consensus is that dosimeter should be placed “near the most exposed eye”; however, there is no specific consensus on what “near” constitutes

EGDLE Report Summary (3)

- When individual monitoring is required, **majority of regulators require personal dose equivalent $H_p(3)$ to be measured**, and use of surrogate dosimeters (for example, those that measure $H_p(0.07)$ and $H_p(10)$) is not acceptable to demonstrate compliance with lens of the eye dose limits:
 - particularly true for medical applications, but not for nuclear/non-nuclear applications
- **No consensus amongst respondent countries regarding the use of surrogate dosimeters and correction factors** (for example, providing a correction factor that is applied to surrogate dosimetry result(s) in order to ascertain dose to the eye), and in some instances, this method is not allowed.
- Generally recognised that **workplace monitoring is not acceptable to demonstrate compliance with lens of the eye dose limits.**

EGDLE Report Summary (4)

- **$H_p(3)$ eye lens dosimeters are not approved and/or available across the majority of the respondent countries.**
- **Eye lens dosimeters are typically approved only for photons, and not for beta and neutron radiations;** this is a particular concern and challenge expressed mainly by nuclear regulators.
- In some cases, for beta and neutron radiations, **the use of the dosimeters for photon and neutron measurements is acceptable**, on the basis of adequate inter-comparison that they fulfil the related requirements.
- As a function of the availability of eye lens dosimeters in the country, **the technical requirements for eye lens dosimeters are more or less defined and align/follow IEC and ISO standards.**
- **No consistent approach in individual monitoring services' participation in national and/or international inter-comparisons.** Either no decision has been made by a number of countries, procedures have yet to be implemented, or regulatory guidance has not been published.

EGDLE Report Summary (5)

- Country responses indicate that **challenges associated with recording doses to the lens of the eye are not fully known.**
- Main issue with recording dose to the lens of the eye is **ensuring the application of correct methods for the determination of the dose when a surrogate dosimeter is used:**
 - if the lens of the eye dose is determined with surrogate dosimeters or other techniques, observed as a challenge on how to record lens of eye dose from surrogate dosimetry or a surrogate technique, and how this would be distinguished from the dose recorded using $H_p(3)$ eye lens dosimetry
- **Challenges with recording include accounting for personal protective equipment and use of correction factors, dosimeter placement, use of surrogate dosimetry, and/or accounting for workplace monitoring methods.**

EGDLE Report Summary (6)

- Most countries are effectively advancing on addressing practical challenges, in consult with stakeholders.
- Respondent countries providing feedback agree that standardised and/or harmonised procedures, guidance and requirements would be beneficial around the following themes:
 - eyewear protection and/or other protective devices, including suitability for exposure situations
 - harmonisation of accreditation and technical specifications for Hp(3) eye lens dosimeters
 - internationally accepted eye lens dosimeters and clear instructions for their use
 - education and training
 - use of personal protective equipment
 - non-uniform exposure situations
 - use of correction factors
 - standardising dosimeter placement, especially in medical applications

EGDLE Report Summary (7)

- **Opportunities identified for continued dialogue and information exchanges in the international fora**, including:
 - requirement for individual monitoring, and consensus on use of eye lens dosimeters measuring personal dose equivalent $H_p(3)$
 - eye lens dosimetry, with use of ISO and IEC standards to define accreditation and technical/performance specifications for $H_p(3)$ eye lens dosimeters
 - dosimeter placement, taking into account personal protective equipment
 - acceptability of the use of surrogate dosimeters and correction factors
- **Research needs** identified in this report could also significantly contribute to advances in radiological protection aspects for the eye, in addition to **improvements in eye lens dosimetry**.

Next Steps

- Next steps include establishing a means for continued dialogue and information exchange on the implementation of revised dose limits for the lens of the eye in occupational exposure situation.
- It is envisioned that the types of information exchange would be hosted by the NEA and would include such topics as:
 - sharing of regulatory approaches, best practices and experiences
 - advances in research related to eye dosimetry and effects of radiation exposure on the lens of the eye
 - advances in eye dosimetry related to technologies, accreditation, technical and performance specifications and intercomparisons
- Proposal to be presented at the next annual meeting of the CRRPH occurring March 29-31, 2022.

Thank you for your attention.

Members of the EGDLE:

A. Rossini (Argentina),
C. Dodkin (Canada),
U. Oeh (Germany),
D. Pollard (Ireland),
M.A. Chevallier (France),
S. Yokoyama (Japan),
M.D. Rueda Guerrero (Spain),
G. Testa, L. Hafner (Switzerland)
V. Rees (United Kingdom),
J. Dillard (United States of America)



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