

EPRI Research Informs Decisions on Eye Dose Limits for Occupational Workers

EPRI-commissioned scientists are evaluating major findings and research gaps related to radiation effects on the eye, providing input into regulatory changes and the selection of eye monitoring and protection

Irradiation of the eye can cause lens damage, potentially leading to cataracts and other vision impairment. Results of recent epidemiological studies of the radiation effects on the eye led the International Commission on Radiological Protection (ICRP) to recommend lowering the lens-of-eye dose limit for occupational workers to about 7.5 times below the previous limit of 150 mSv/yr (15 rem/yr). To date, however, these recommendations have not been fully endorsed by all regulators and scientific/professional organizations.

To provide additional insights, EPRI commissioned a group of scientists in the fields of epidemiology, radiation biology, and medical physics to evaluate the current scientific literature and synthesize the major findings, limitations, and research gaps. The results of this evaluation will be used to inform discussions between regulators, stakeholders, and scientific organizations like the National Council on Radiation Protection and Measurements (NCRP). A detailed scientific understanding of the radiation effects, dosimetry, and epidemiology associated with the lens of the eye is essential for industries that have to manage radiation exposure to occupational workers so that appropriate eye monitoring and protection can be applied.

EPRI's scientific review committee assessed the basis and criteria used to establish the previous lens dose limit of 150 mSv/yr and reviewed recent ICRP statements, criteria, evaluation, and recommendations. Additionally, the scientific review committee identified and compiled recently published radiation epidemiology of the eye studies and mechanistic studies in the literature, including those from the Department of Energy, the National Aeronautics and Space Administration, and others. The committee also established a rigorous approach for evaluating all potentially relevant studies of human subjects.

The most important implication of EPRI's evaluation is that the probable risks for cataracts based on a systematic review of the epidemiological data are likely increased at an exposure level somewhat less than the earlier ICRP and NCRP estimates. However, large uncertainties still exist with the radiation epidemiology. With respect to thresholds, there is currently not enough information to determine a chronic exposure threshold for cataracts. Therefore, the presence or value of a dose threshold should still be considered less well known.

In addition to reviewing the human epidemiology, the committee assessed the basic types and biology of cataract formation, including molecular, cellular and animal data. The analysis concluded that although these studies clarified some of the mechanistic data associated with the development of cataracts and provided some data on dose-response relationships in a range of different animals, additional mechanistic data are needed. At this time, it is not possible to incorporate these radiobiological data into specific thresholds or risks for humans.

Details are available in EPRI report [3002003162](#), *Epidemiology and Mechanistic Effects of Radiation on the Lens of the Eye: Review and Scientific Appraisal of the Literature*. For more information, contact Phung Tran at 650.855.2158 or ptran@epri.com.

Electric Power Research Institute

3420 Hillview Avenue, Palo Alto, California 94304-1338 • PO Box 10412, Palo Alto, California 94303-0813 USA
800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com

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