HEALTH PHYSICS SOCIETY

Specialists in Radiation Safety

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Cindy K. Bladey
Chief, Rules, Announcements and Directives Branch (RADB)
Division of Administrative Services, Office of Administration
Mail Stop: TWB-05-B01M
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

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Attn: Rulemaking and Adjudications Staff

Subject: Docket ID NRC–2009–0279, **Recommendations on the Annual Dose Limit to the Lens of the Eye**

Dear Ms. Bladey:

The Health Physics Society[i] (HPS) is a professional organization whose mission is to promote excellence in the science and practice of radiation safety. The HPS appreciates the opportunity to respond to the Nuclear Regulatory Commission's solicitation of early input on the potential reduction in the dose limit to the lens of the eye. The HPS has taken the position that the current dose limits are adequately protective for workers, and we believe that any new data on biological effects of radiation should be examined for their potential impact on improving safety. We also believe the new scientific data on radiation effects on the lens of the eye need to be examined carefully in considering any policy changes that affect dose limits.

The April 2011 statement on tissue reactions[ii] published by the International Commission on Radiological Protection (ICRP) and the current scientific literature provide a scientific basis for establishing an annual dose limit to the lens of the eye. It has been known for some time that relatively high doses to the lens of the eye (> 2 Gy) can result in serious lens opacities leading to cataracts. New studies indicate that acute exposures of about 0.5 Gy are sufficient to cause cataracts. For fractionated and protracted exposures, new studies also suggest a threshold value of about 0.5 Gy to the lens of the eye, but this is for lens opacities rather than cataracts that impair vision. The HPS also notes that lens dosimetry is not well developed and entails substantial uncertainty. Additionally, the mechanism by which radiation might cause cataracts following low dose fractionated exposures is not well defined. Because occupational doses consist mainly of fractionated exposures over time (not acute exposures), the HPS recommends that these new data

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be carefully evaluated during any deliberations to change the current annual dose limit to the lens of the eye.

It is currently unclear how frequently radiation opacities might advance to visual impairment. Evidence is accumulating that both dose and latency play a role in changes to the posterior subcapsular region of the lens, but the latency period tends to be quite long and inversely related to dose. Consequently, if surgical correction is required, it usually occurs later in life when cortical opacities are common and are the main reason for the surgery. Because cataract extraction rates are not well documented in occupational cohorts, it is difficult to judge the impact of radiation dose on the ability of the worker to perform his/her duties.

Operationally, two occupations that will be challenged to meet the ICRP recommended limit to the lens of the eye are the interventional cardiologists and interventional radiologists who use x rays to visualize internal structures of the body. The medical and health physics communities have been concerned about the relatively high exposures that are possible. When a patient with a serious medical condition is on the table, these physicians tend to put the needs of the patient ahead of their own need to meet a regulatory exposure limit. In some interventional laboratories, the work load is high enough that interventionalists may spend most of the day in the lab. After several hours, the leaded protective glasses become uncomfortable. In addition, leaded glasses may interfere with the interventionalists' ability to conduct procedures. Pull-down ceiling shields have been installed successfully in some labs to protect interventionalists, but in some cases the shield may interfere with the procedures. Health physicists continue to work with interventionalists to find ways to reduce dose through the use of eye protection and increased awareness of the need for protective measures. Some interventions are expensive, and appreciably lowering the annual dose limit to the lens of the eye would have a cost consequence that should be considered if the benefit to the practitioners is not clearly indicated or judged to be small.

HPS recommends that the scientific basis for cataract development (and not minor lens opacities that do not impair vision) be clearly delineated for chronic radiation exposures (as experienced by occupational groups) before changing the annual dose limit to the lens of the eye. The HPS remains concerned about the radiation levels experienced by interventional radiologists (including cardiologists), and recommends that continued education and protective measures be pursued. Because these medical intervention circumstances would be challenged to meet the ICRP recommendation level, the benefit in future reduction of radiation cataracts that impair vision should be balanced against the costs of introducing the protective measures and potential impact on medical care.

We also encourage the NRC to fully evaluate the practical impact of radiation on the lens of the eye by collecting data on cataract extraction rates in radiation workers, particularly in recently retired workers and interventional radiologists. Such data would support policy changes as well as promote understanding the effects of radiation on the lens of the eye. The HPS also recommends that NRC fund the National Council on Radiation Protection and Measurements (NCRP) to prepare a report or commentary on the radiation effects on the lens of the eye, which could be used as the basis for any change in the dose limit.

Finally, the ICRP's basis for the selection of the recommended dose limit is not clear. The ICRP has recommended a dose limit to the lens of the eye of 20 mSv in a year, averaged over defined periods of five years, with no single year exceeding 50 mSv. The HPS looks forward to the upcoming ICRP publication on tissue reactions in this regard, as well as the presentation by Dr. Norman Kleiman (of Columbia University) on cataracts and radiation exposure at the October 2011 ICRP Symposium in Bethesda, Maryland.

If you have any questions regarding these comments, please feel free to contact me at 509-371-7888 or kathy.pryor@pnnl.gov.

Sincerely,

Kathryn H. Pryor

Kathryn H. Pryor, CHP
President

cc: Brett Burk
Steven King
Vicki Morris

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[1] The Health Physics Society is a nonprofit scientific professional organization whose mission is to promote the practice of radiation safety. Since its formation in 1956, the Society has grown to approximately 5,000 scientists, physicians, engineers, lawyers, and other professionals representing academia, industry, government, national laboratories, the department of defense, and other organizations. Society activities include encouraging research in radiation science, developing standards, and disseminating radiation safety information. Society members are involved in understanding, evaluating, and controlling the potential risks from radiation relative to the benefits. Official position statements are prepared and adopted in accordance with standard policies and procedures of the Society.

[11] ICRP ref 4825-3093-1464, *Statement on Tissue Reactions*, Approved by the Commission, April 21, 2011