The Boice Report #3

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One of the best conferences on radiation and health is hosted every two years by the American Statistical Association (ASA). These biennial conferences began in 1981 and have something for everyone—the statistician, epidemiologist, clinician, risk assessor, biologist and, yes, even the health physicist. The format is informal, with plenty of down time to discuss radiation issues one-on-one with experts in the field. The 20th conference—"Late Health Effects of Radiation Exposure: New Statistical, Epidemiological and Biological Approaches"—was held 10–13 June 2012 in Kennebunkport, Maine. Keynote speaker David Brenner discussed "Living with Uncertainty about Low-Dose Radiation Risks." The conference was attended by 72 scientists, 29 from foreign countries. Abstracts are available on the ASA website (http://www.amstat.org/meetings/radiation/2012/) and extended abstracts will be published in *Radiation Research* as in years past. A few selected highlights are below.

- **Session 1: Breast Cancer Risk.** The underlying genetic basis for the clustering of breast cancer in some families has been increasingly understood, but it is yet to be determined whether radiation enhances this susceptibility. Ongoing research on gene-radiation interaction is being conducted within the WECARE study (e.g., http://www.ncbi.nlm.nih.gov/pubmed/22087758). Radiation-induced breast cancer is influenced by radiation dose and age at exposure, and there is some evidence to suggest that low dose rate protraction (but not high dose rate fractionation) may result in a reduction of risk (e.g., http://www.ncbi.nlm.nih.gov/pubmed/12105993).

- **Session 2: Late Effects of Childhood Cancer.** High-dose radiation therapy to treat retinoblastoma, a rare tumor in childhood related to a damaged RB gene, enhances the risk of developing a sarcoma later in life (http://www.amstat.org/meetings/radiation/2012/AbstractDetails.cfm?AbstractID=302257). Exposure to the testes or ovaries of cancer survivors treated with radiation is not associated with an increased risk of having future children born with birth defects or genetic anomalies. However, high-dose radiation to the uterus among young girls treated for cancer can cause adverse pregnancy outcomes such as stillbirth and neonatal death (http://www.ncbi.nlm.nih.gov/pubmed/20655585). Childhood cancer survivors are at increased risk of developing cardiovascular disease following chest radiotherapy at cardiac doses greater than 5 Gy (http://www.ncbi.nlm.nih.gov/pubmed/19996459). Large-scale studies of childhood cancer survivors in the United Kingdom confirm the heightened risk of developing new tumors, including colorectal cancers, and suggest the need for routine screening; significant risks for brain tumors were not seen below 10 Gy (http://www.amstat.org/meetings/radiation/2012/AbstractDetails.cfm?AbstractID=302256). The cumulative risk of breast cancer following chest radiotherapy for childhood cancer is very high and reaches 20 percent by age 45 (http://www.amstat.org/meetings/radiation/2012/AbstractDetails.cfm?AbstractID=302258).

- **Session 3: Radiation-Related Risk of Leukemia.** Workers at the Mayak Production Association and the population living near the Techa River who were exposed to radioactive ma-

terials released from the Mayak facility are at increased risk of leukemia. Despite difficulties of dose reconstructions, low dose rate exposures accumulating to a high level are associated with an increased leukemia risk that may last for many years (http://www.amstat.org/meetings/radiation/2012/AbstractDetails.cfm?AbstractID=302248). Leukemia risk among Chernobyl cleanup workers from the Ukraine has been reported at a level somewhat below that seen among atomic-bomb survivors; an increase in chronic lymphocyte leukemia, a site not considered to be radiation related, tempers interpretations (http://www.amstat.org/meetings/radiation/2012/AbstractDetails.cfm?AbstractID=302260). A new study on the risk of brain tumor and leukemia associated with CT scans among persons under the age of 21 generated much discussion (http://www.ncbi.nlm.nih.gov/pubmed/22681860). Concerns included the absence of information on why the CT exams were performed, the incompleteness of dosimetry because repeat examinations were not known and individual dose reconstructions were not performed, and an unexpected association with age at exposure and brain tumor, with risk increasing with age at exposure and not decreasing as seen in other studies. Nonetheless, the study raised concerns about unnecessary examinations and the need to reduce radiation dose without compromising the desired image quality. Uncertainties in epidemiologic studies will be addressed in the upcoming NCRP Report No. 171, *Uncertainties in the Estimation of Radiation Risks and Probability of Disease Causation*, to be published this year.

- **Session 4: Elaine Ron Memorial Symposium on Thyroid Cancer.** Pooled analyses of 14 studies of thyroid cancer and radiation exposure in childhood are continuing (http://www.amstat.org/meetings/radiation/2012/AbstractDetails.cfm?AbstractID=302264). Studies of thyroid cancer incidence among atomic-bomb survivors find little excess risk following exposures after age 20 (http://www.amstat.org/meetings/radiation/2012/AbstractDetails.cfm?AbstractID=302265). Genetic susceptibility, gene expression, and uncertainty analyses are topics of current interest following radiation exposure and thyroid-cancer risk.

- **Session 5: Cardiopulmonary Effects from Therapeutic and Diagnostic Radiation.** The latest updates of the classic Louis Hempelmann study of children irradiated for enlarged thymus glands find increased risks for cancers of the thyroid and breast, but not coronary heart disease (mean cardiac dose of 1.45 Gy; range 0.17-2 Gy) some 70 years after exposure (http://www.amstat.org/meetings/radiation/2012/AbstractDetails.cfm?AbstractID=302277). Over 10 million cardiac imaging procedures are performed each year, raising concerns over future risks. Radiation-induced pulmonary injury remains an important late effect of cancer treatments.

Stay tuned for the 2014 conference—it is open to everyone and the venues are always pleasant.

Kennebunkport, the site of the 2012 conference