

The Boice Report #14



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UNSCEAR – May 2013 Meeting in Vienna, Austria

The 60th Session of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) was held 27–31 May 2013 in Vienna, Austria (www.unscear.org). Established by the General Assembly of the United Nations in 1955, UNSCEAR assesses and reports on the levels and effects of exposure to ionizing radiation (www.unscear.org/unscear/en/publications.html). Carl-Magnus Larsson (Australia) was chair, Emil Bédi (Slovakia) was vice-chair, and Yoshiharu Yonekura (Japan) was rapporteur. Fred Mettler (head of the U.S. delegation) participated in his 31st session and I in my 21st. Three of the six U.S. delegates ([picture on page 24](#)) are members of the Health Physics Society. Most of the week was engaged in discussing reports on Fukushima and exposures in childhood. Progress was summarized in a press release (UNSCEAR 2013) and during a press briefing available on YouTube (www.youtube.com/watch?v=qyLDNg3VBMU).

- Twenty-seven countries and several international organizations were represented and over 150 were in attendance—a record. Countries sending more delegates than the United States (6) included Russia (12), Japan (12), Belgium (10), Germany (9), China (8), and France (7).
- A draft report on Fukushima was extensively discussed. It was concluded, “Radiation exposure following the nuclear accident at Fukushima-Daiichi did not cause any immediate health effects. It is unlikely to be able to attribute any health effects in the future among the general public and the vast majority of workers” (UNSCEAR 2013). It is anticipated that the report will be published by the end of the year.
- No deterministic or tissue reactions occurred among the 25,000 workers, which includes the Tokyo Electric Power Company employees and contractors. No deaths related to radiation were observed, in contrast to Chernobyl, where approximately 30 emergency workers died from acute radiation sickness within a few months after the accident. Early reports of transient mild erythema to the feet of three Fukushima workers who waded in contaminated water apparently were incorrect. The average effective dose for workers was on the order of 10 mSv. Over 400 workers received greater than 50 mSv effective dose and about 167 received greater than 100 mSv effective dose. Radioactive iodine was an important contributor to effective dose among at least 12 workers who were estimated to have received up to 12 Gy thyroid absorbed dose (WHO 2013).
- The effective action of the Japanese authorities to shelter in place, evacuate, and restrict distribution of contaminated food stuffs resulted in low population exposures, well below the levels received in a year from natural background radiation for the vast majority of residents in Fukushima Prefecture.
- Population dose estimates were lower than those used in the recent World Health Organization (WHO) report (2013), in part because more information was available to the UNSCEAR committee (UNSCEAR 2012). Available information also included measurement data in children and U.S. military personnel and dose reconstructions based on over 300,000 questionnaire responses (Boice 2013). The population dose estimates were so low that the UNSCEAR committee refrained in large part from projecting hypothetical risks into the future, because in

practically all instances, the estimated dose levels were far below those where human health effects have been observed by epidemiologic study.

- A health survey of two million Fukushima residents is expected to last for 30 years (Yasumura 2012; UNSCEAR 2012).
- A major report on effects of radiation exposure on children will be published this year. Fred Mettler is the lead consultant, with help from Louis (Sandy) Constone (the University of Rochester), Dietmar Noßke (Bundesamt für Strahlenschutz, Germany), and Roy Shore (Radiation Effects Research Foundation). This landmark document, first of its kind, will be well referenced for many years to come. It covers all you want to know about children, from anatomy to dosimetry to radiosensitivity. Did you know that the terrestrial dose to children is higher than to adults because children are closer to the source (i.e., the ground)! An overview was presented at the March 2012 National Council on Radiation Protection and Measurements Annual Meeting by Fred A. Mettler, Jr., during his Warren K. Sinclair Keynote address (http://www.ncrponline.org/Annual_Mtg/2012_Ann_Mtg/Mettler.pdf), which will be published this year in your favorite journal, *Health Physics*.
- Exposures in childhood (defined in this report as under the age of 20 years) are not always more risky than exposures at older ages. Children are more radiosensitive for about 30 percent of cancers when compared with adults. These include leukemia and thyroid, skin, and brain cancer (UNSCEAR 2013). Children have the same sensitivity as adults for 25 percent of cancers, such as the renal pelvis and bladder (transitional cell tumors), and are less sensitive than adults for about 10 percent of cancers such as lung cancer. For about 15 percent of cancers, such as esophageal cancer, the data are too weak to draw any conclusions regarding differences in risk with age at exposure. Finally, for about 20 percent of cancers (including multiple myeloma, Hodgkin lymphoma, and pancreas, prostate, rectum, and uterus cancer), there is only a poor or no relation between radiation exposure and risk regardless of the age at exposure.
- Similarly for high-dose exposures, childhood exposure poses more risk than adult exposure for some noncancer outcomes (e.g., for adverse effects in the brain, cataracts, and thyroid nodules), the same risk for some outcomes (e.g., neuroendocrine system and effects in the kidneys), and lower risk for other adverse health effects involving the lung, immune system, bone marrow, and ovaries (UNSCEAR 2013).
- There were lively discussions about the new study from Australia reporting very strong associations between brain tumor, leukemia, and other cancers and computerized tomography (CT) scans among children and teenagers under the age of 20 (Mathews 2013). Similar to the concerns raised about a previous study from the United Kingdom (Pearce 2012), the major methodological reason to doubt the causal nature of the associations is the absence of information on why the CT exams were performed, coupled with the incompleteness of dosimetry, because repeat examinations were not known and individual dose reconstructions were not performed (NCRP 2012). Remarkably, practically all cancers in the Australian study were significantly associated with CT exposure, with the highest risk seen for melanoma, a cancer not considered to be inducible by radiation. In contrast, breast cancer (a tissue highly susceptible to radiation) was one of the few cancers for which no increased risk was seen. A one-year latency interval was used in the analysis, which is much too short for radiogenic cancers to develop, particularly solid cancers. Suffice it to say that the associations appear to reflect reverse causality (confounding by indication) in that the reasons why the children received frequent CT exams were the likely reasons why the cancers developed, i.e., the symptoms or prodromal stages of cancer caused the x rays and not vice versa! A classic example of confounding by indication is the association reported between ^{131}I diagnostic examinations among adults and subsequent thyroid cancer (Dickman 2003). When the reasons for performing the examination (i.e., suspicion of thyroid tumor) were accounted for in the analyses, the association with ^{131}I disappeared, consistent with other studies indicating that the adult thyroid gland is not very radiosensitive. Without removing patients with a suspicion of thyroid tumor from the evaluation, the associa-

tion between ^{131}I exposure in adulthood and subsequent thyroid cancer remained for over 20 years, indicating that effects of known (or unknown) selection factors for why patients receive medical examinations can persist for decades.

- A report on attributing health effects to ionizing radiation should be published this year, as well as a report on uncertainties in risk estimates for cancer due to exposure to ionizing radiation (UNSCEAR 2012). Reports in the works include *Epidemiology of Low-Dose-Rate Exposures of the Public to Natural and Artificial Environmental Sources of Radiation*, *Radiation Exposure From Electricity Generation*, *Biological Mechanisms of Radiation Actions at Low Doses*, and *Exposure From Internal Emitters (Tritium and Uranium)*.

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**U.S. Delegation to the 60th Session of UNSCEAR
27– 31 May 2013 in Vienna, Austria**



Standing, left to right: John D. Boice, Jr. (NCRP, Vanderbilt University), Lynn R. Anspaugh (University of Utah), R. Julian Preston (U.S. Environmental Protection Agency, Retired), Fred A. Mettler, Jr. (U.S. Representative, University of New Mexico, Department of Veterans Affairs), E. Vincent Holahan (U.S. Nuclear Regulatory Commission), Louis (Sandy) Constine (University of Rochester, consultant to UNSCEAR, but not U.S. delegate); Sitting: Naomi H. Harley (New York University).

Photo courtesy of Jing Chen (Canadian delegate)