

## **Nuclear Energy and Health, And the Benefits of Low-Dose Radiation Hormesis By Jerry M.**

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Energy needs worldwide are expected to increase for the foreseeable future, but fuel supplies are limited. Nuclear reactors could supply much of the energy demand in a safe, sustainable manner were it not for fear of potential releases of radioactivity. Such releases would likely deliver a low dose or dose rate of radiation, within the range of naturally occurring radiation, to which life is already accustomed. The key areas of concern are discussed. Studies of actual health effects, especially thyroid cancers, following exposures are assessed. Radiation hormesis is explained, pointing out that beneficial effects are expected following a low dose or dose rate because protective responses against stresses are stimulated. The notions that no amount of radiation is small enough to be harmless and that a nuclear accident could kill hundreds of thousands are challenged in light of experience: more than a century with radiation and six decades with reactors. If nuclear energy is to play a significant role in meeting future needs, regulatory authorities must examine the scientific evidence and communicate the real health effects of nuclear radiation. Negative images and implications of health risks derived by unscientific extrapolations of harmful effects of high doses must be dispelled. DOWNLOAD REPORT AT RIGHT MARGIN.

### **Short Biographies of the Authors:**

#### **Dr. Cuttler**

University of Toronto, 1960-64, BAsC&Eng, Eng Physics (Nuclear)

Israel Atomic Energy Commission, Nuclear Chemistry Dept., 1964-67, R&D Engineer, nuclear fission

Israel Institute of Technology, 1964-71, M.Sc. Nuclear Engineering, D.Sc. Nuclear Sciences; Manager, IIT Van de Graaf Laboratory at Weizmann Institute of Science

Seforad Applied Radiation Ltd., 1971-74, Technical Manager, detectors for x-rays, gamma rays, neutrons

Atomic Energy of Canada Limited: 1974-82, led the teams that designed and provided the reactor control, safety system and radiation monitoring instrumentation for CANDU 6 reactors at Pt. Lepreau (New Brunswick), Gentilly-2 (Quebec) and Embalse (Argentina) and for the reactors of the Pickering B and Bruce B stations (Ontario); provided support to the Douglas Point, Pickering A and Bruce A stations. 1982-85 Engineering Manager of AECL work, Bruce B Project; 1985-86 Resident Engineering Manager, Romania on Cernavoda Project; 1987-90 Engineering Manager, 10 MW SLOWPOKE Energy System Project, provided licensable design for reactor to heat University of Saskatchewan. 1990-94 Manager, Operating Station Support at Pickering NGS providing AECL services; 1994-96 Manager, Engineering Integration, CANDU 9 Project; 1996-98 Technical Manager: update of KANUPP Safety Report, assess cost to manage Chalk River radioactive waste; 1999-2000 Manager, Y2K support to owners of legacy products

and support to the CANDU stations during Y2K rollover.

Canadian Nuclear Society, 1990-97 Council, 1995-96 President, 2000 Appointed Fellow.

Cuttler & Associates Inc., 2000-present, services to: Ontario Power Generation (Pickering A Unit 4 Return to Service, Pickering B Life Extension) AECL (MDS Nordion Medical Isotopes Reactor Project, to produce molybdenum-99) Bruce Power (Bruce A Units 1 and 2 Restart after 1997 lay-up).

1996-present, assessing the effects of ionizing radiation on health and drawing widespread attention in Canada and abroad to the beneficial effects of low doses.

### **Dr. Pollycove**

1953-55 1955-61 1962-91 1962-91 1964 1972 1991-02

1921 Born, Nogales, Arizona

1942 California Institute of Technology, B.Sc. (Physics, Mathematics)

1942-46 Physicist, U.S. Navy, Bureau Naval Ordnance, Radar Officer, during WWII

1946-50 University of California, San Francisco School of Medicine, M.D.

1950-53 U.S. Army Medical Corps, during Korean War

1950-51 Harvard Medical School, Boston City Hospital, Resident, Internal Medicine

1951-53 US Army Chemical Center, Edgewood, MD, Biophysicist, Biophysics Division

1953-55 Tufts Medical School, Boston Veterans Administration Hospital, Resident, Internal Medicine

1955-61 U of California Berkeley (UCB), Lawrence Radiation Lab, Donner Lab, Research Associate

1962-91 U of California San Francisco (UCSF), School of Medicine, 1964 Professor, Lab Medicine and Radiology, 1991 Professor Emeritus

1962-91 San Francisco General Hospital (SFGH), SFGH Clinical Laboratory, Assistant Director, 1968 Director; Nuclear Medicine Department, Chief of Service

1964 Board Certified Pathologist (CP), American Board of Pathology

1972 Board Certified, American Board of Nuclear Medicine

1991-02 US Nuclear Regulatory Commission (NRC), Visiting Medical Fellow

Biomedical research began in 1951 at the US Army Chemical Center with two-year establishment of the cause of non-hemorrhagic fatal traumatic shock. Hematology research began in 1953 at Boston VA Hospital using chromium-51 and iron-59 to quantify iron and red cell kinetics in normal subjects and patients. This research was refined and expanded at UCB. Metabolic studies of glucose, monocarbon pool, folic acid, and vitamin B12 were initiated at Donner Laboratory, UCB and continued at SFGH (110 publications, 66 abstracts). As Director of the Clinical Laboratory SFGH, I was responsible for services of the Chemistry, Microbiology, and Immunology Divisions and additionally responsible as Division Chief of the Nuclear Medicine, Hematology, and Blood Bank services. Teaching of Nuclear Medicine, Hematology, and Clinical Pathology to residents, medical students and house officers was also a major responsibility. Participation in numerous national and international organizations and activities served to develop the specialties of nuclear medicine, hematology, and clinical pathology.

The NRC Visiting Medical Fellow is expected to understand and be familiar with the charge, policy and function of the NRC; to provide the NRC with expertise in the medical use of radioisotopes, both diagnostic and therapeutic; and be an effective liaison responsive interface and good communicant between the NRC and the medical community. In addition, a number of projects were of special importance: The Quality Management Program and extension to Pregnancy and Breast Feeding; The National Academy of Science Institute of Medicine Review and Assessment of NRC Regulation of Medical Activities; General Morbidity and Mortality Risks of General Anesthesia, Surgery, Chemotherapy, Radiation Therapy and Radiation Therapy Misadministration; International Symposium and Workshop on Quality Guidelines in Nuclear Medicine; Evaluation of EPA Risk Analysis of I-129 Release from a Spent Fuel Repository; and the Sacred Heart Hospital Investigation, and Evaluation and Communication of the Radiobiological Effects of Low Level Radiation Exposures. This evaluation and analysis continues to be my primary research project because of its overriding importance to our understanding of low-dose radiation in health and disease and its consequent impact on prevention and therapy of cancer, the disposal of radioactive waste and the needless expenditure of many hundreds billions of dollars. This project includes meetings, conferences, lectures, publications, collaboration with the United Nations Scientific Committee on the Effects of Atomic Radiation in preparing Annex B of the UNSCEAR 1994 report, and support of Biological Effects of Low Level Exposures (BELLE) activities (1993-2008).

Publications: 130 journal articles; 12 book chapters

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