

# Radiation and Children: The Ignored Victims

Hundreds of U.S. industrial sites that generate nuclear electricity and manufacture nuclear weapons regularly release radiation to our air, water and soil via the burial of wastes. These same industries are now lobbying for permission from government to release radioactive materials for re-use in consumer products. **There is no safe radiation dose. Whether the release is accidental or allowed is irrelevant.** This dramatic surge in the release and distribution of radiation, makes it ever more clear that we do not need a nuclear accident to cause disease.

## The Tyranny of “Standard Man”

Unfortunately, even when nuclear activities are performed within legal, “allowable limits,” our children are not protected. This is for a simple reason: U.S. radiation protection standards assume that the individual exposed to the harmful radiation released is an adult male. A child exposed to the same release of radiation would often experience a larger dose. The “protection” standards ignore this fact.

## The “Allowable” Poison

Radiation regulations are written by international state and federal agencies. Since no industrial scale nuclear operation is possible without the routine release of radioactive materials, regulators have established “allowable” levels of radiation exposure. All life on Earth is exposed to and impacted by natural sources of ionizing radiation. Radiation exposures are increasing due to planned and accidental releases of man-made radioactivity. Nuclear reactors, central to both nuclear electricity and nuclear weapons production, actually make new radioactivity. Natural uranium is radioactive, but putting uranium fuel in a reactor results in wastes that are millions of times “hotter” after only a few years of use. These materials are much more potent in contaminating human and environmental systems. Every radiation exposure carries with it risk of adverse health effects, so increasing radiation exposure increases risk to our health whether the radiation is natural, more biologically available due to human interference, or human-made.

## Children Are More Susceptible

Radiation--invisible, odorless, tasteless--tears at the very fabric of what makes us human: our genetic material. Children and the unborn are especially susceptible because of their rapid cell

division during physical growth. DNA is most vulnerable to radiation impact while cells divide. In addition to cancer and birth defects, evidence exists that radiation is permanently mutating the gene pool and contributing to its gradual weakening, resulting in “developmental deficiencies in the fetus, hereditary disease, accelerated aging, and such non-specific effects as loss of immune competence” [*The New Scientist*].

The work of Dr. Alice Stewart, a British epidemiologist, established in the 1950’s that children born to women who received even one abdominal x-ray during pregnancy were four times more likely to suffer childhood cancer as a “post-birth defect.”

Childhood disease clusters have been found in many communities with nuclear facilities. This list includes increases in childhood leukemia near reprocessing facilities in La Hague, France and at Sellafield in the British Isles and the Krummel nuclear reactor in Germany. Childhood leukemia cases near Sellafield are associated with occupational exposure to the father before *conception* of the child. Increases in childhood leukemia also occurred Europe-wide after the passage of the Chernobyl radiation cloud. Increases in other childhood cancers have been found near nuclear operations in the Navaho Nation (uranium mining), Brookhaven, New York (nuclear weapons), and nuclear power stations in Oyster Creek, NJ and Clinton, Illinois. Increases in down syndrome are found near Yankee Rowe power station in Massachusetts. Heart defects of various types have been associated with ionizing radiation exposure as well.

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## **Error-ridden Assumptions**

The process of setting radiation standards and also determining whether a particular release of radioactive water or other material meets those standards, requires many assumptions. The first of these is about the individual receiving the radiation dose. Most regulators assume that this individual is the "Standard Man:" a fictional individual whose physical characteristics have been defined by officials who set radiation standards. A standard height, weight, age and other parameters are used in equations to project the radiation dose that this hypothetical individual is likely to receive from a given release of radioactivity. Women, fetuses, infants, children, elders and those with compromised immune systems are not Standard Men. Due to many differences including smaller body size, as well as difference in habits (for instance playing outside on the ground), a child may get a radiation dose many times larger than the official dose, based on the Standard Man, as calculated by state and federal radiation "protection" agencies. This larger dose carries with it a greater risk of health consequences. National Council on Radiation Protection (NCRP) states that a child receives 10-50% more of a dose from gamma ground radiation than an adult because their organs are closer to the ground. (NCRP 129 Recommended Screening Limits for Contaminated Surface Soil and Review of Factors Relevant to Site Specific Studies; pg 56 1999). Yet the NRC exposure standards do not account for this difference. This is an external dose scenario. Internal dose scenarios with ingested or inhaled radionuclides often amount to more biological damage to children. For example, Strontium-90 (Sr-90) deposition in the bones can cause bone and blood cancers.

## **Radiation Effects on Real People**

Exposure to radiation increases the risk of damage to tissues, cells, DNA and other vital molecules-- potentially causing programmed cell death (apoptosis), genetic mutations, cancers, leukemias, birth defects, and reproductive, immune, cardiovascular, and endocrine system disorders. The varying impacts on health of each of the hundreds of

different radionuclides to which people may be exposed are simply not known.

Since scientists do not truly know the specific impacts a given radionuclide may have on the organs and tissues of a specific person, the translation of the amount of radioactivity to which that person has been exposed (in curies or fractions of a curie) into a radiation dose (in rems or millirems) is basically speculation. That is, determining the quality and the quantity of a radiation dose and biological damage to tissue is far from an exact science.

## **Unenforceable Standards Are Not Protection**

Radiation standards are written in units called "rems" or "millirems" (one one-thousandth of a rem). Like dose calculations, the unit of dose is based on assumptions – including Standard Man, estimations, averages and computer modeling. As a result, the rem cannot be measured directly; instead it is derived from assumptions and equations, which do not reflect children. No one can say for sure how many rems or millirems any one individual has (or has not) received, therefore standards that use this unit cannot be enforced. An alternative is to prevent the release of radioactivity. When accidents occur it should be assumed that children will be exposed and protective action taken. Most parents support prevention and should seek to avoid any exposure at all. Prevention is the only cure.

*--Cindy Folkers & Mary Olson, August 2004*

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