

4.e Unsustainable Energy - nuclear energy: women and men's different health risks from nuclear radiation

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Nuclear energy presents a highly significant health and environmental risk. Human health is impacted negatively by exposure to nuclear materials at all stages of the nuclear cycle, from the mining of uranium, through to the production of atomic weapons, the generation of nuclear power and the storage of nuclear waste.

Ionizing radiation is able to damage chemical structures of human cells. When cells or their DNA are damaged, the natural cellular process tries to repair the damaged areas. The mutated cell may die, or if successfully repaired and survives, but the mutated DNA can accumulate in the body through subsequent cell divisions that can potentially lead to cancer.

The way in which radiation affects health is dependent on several factors relating to exposure, the type and intensity of radiation, as well as the length of stay in radiated areas. The level of exposure relates to the proximity to the source of radiation and to weather conditions. After nuclear accidents most health effects appear a number of years later, often in the next generation. In fact, the lower the levels of radiation a person is exposed to, the longer the latency period, and the later the disease is likely to be detected.

Ionizing radiation has both direct and indirect health effects, which are known as 'deterministic' and 'stochastic' effects respectively. For deterministic effects there is a direct link between cause and effect. For example, in Chernobyl, 28 power plant workers died after massive exposure to radiation (0.8-16 Gy). Stochastic (or chance) effects entail a latent response in which the probability of developing a disease, such as cancer, cataracts, heart or vascular disease, increases later in life. However, the origin of the disease is difficult to trace back to radiation, because these diseases can also have other causes. The largest stochastic effect in Chernobyl was the dramatic increase in thyroid cancer in the area surrounding the power plant.

Equally dangerous impacts include non-carcinogenic diseases. For example, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) estimates that between 30,000 and 207,500 children have been born with genetic mutations due to nuclear radiation from the Chernobyl disaster, since 1986.

Women and children are at greater health risk

It is notable that women and children suffer greater health damage from radiation. One specific consequence of radiation is its effect on reproductive health. After Chernobyl a lower fertility rate was observed in affected areas, while the number of stillbirths increased dramatically. Additionally in remote areas of Poland, there were fewer live births in 1986 compared to previous years. In the Chernobyl region there were also indications of many miscarriages, and the number of miscarriages in Western Europe also increased as a result of the Chernobyl disaster.¹³⁹

Moreover, cancer incidence and death as a result of exposure to radiation is higher for women than it is for men.¹⁴⁰ The NAS¹⁴¹ 2011 report finds that the probability of women suffering from cancer are

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¹³⁹ Korblein, 2001

¹⁴⁰ Biological Effects of Ionizing Radiation (BEIR) VII, Phase 2 report, "Health Risks from Exposure to Low Levels of Ionizing Radiation," published by the National Academy Press in 2006, Washington, D-C.

50% higher than the comparable harm to men from radiation doses that fall within the legal limit to the public over a lifetime [p.1]. The risk depends on both sex and age at exposure, with higher risks for females and for those exposed at younger ages [p.7]. The risks appear to be higher in women treated for benign breast conditions, suggesting that they may be at an elevated risk of radiation-induced breast cancer. Radiation sensitivity depends on age and sex, and is especially high in females. The higher sensitivity seen in females is a result of, among others, hormones and cell growth in certain tissue, for example, in breasts.

The latest research clearly shows that current radiation protection is in cases where women are pregnant. Radiobiological research focuses mainly on malformations that may occur during the organ formation in weeks three to seven¹⁴², mental retardation, which usually occurs during week eight to 15 or in a weaker form in weeks 16 to 25¹⁴³; and cancer, especially leukaemia, which may develop anytime during the pregnancy and is induced by low radiation doses.¹⁴⁴

Children are especially at risk from radiation, because there is more cell division during childhood growth and development. Dividing cells are more susceptible to mutation than resting cells. In addition, growing children assimilate more nutrition into the body than is released, therefore substances which are contaminated will be more readily incorporated. For example, the thyroid gland of growing children quickly takes up iodine. UNSCEAR suspects that the consumption of radioactive iodine in milk is responsible for the high number of thyroid cancer cases diagnosed between 1991 and 2005 in children who were younger than 18 years when the Chernobyl disaster occurred. Moreover, an epidemiological investigation mandated by the Federal Office for Radiation Protection¹⁴⁵ focused on childhood cancer in the proximity of nuclear power plants concluded that the risk of developing leukaemia increases in relation to one's proximity to a nuclear power plant.

Perinatal mortality due to Chernobyl and above ground nuclear tests

A number of academic research projects have shown that the effects of low-level radiation on a foetus can be terminal. After the accident in Chernobyl, Germany witnessed a highly significant correlation between exposure of pregnant women to caesium and perinatal mortality seven months later. A local connection between caesium soil exposure in Bavarian districts and increase in rates of perinatal mortality in 1987 was reported. In one particular area of Bavaria, where there was a 0.5 mSv per year increased background radiation, infant mortality was significantly higher (15.7 %) than in the rest of the region. As a consequence of above-ground nuclear tests, West Germany also showed a marked increase in perinatal mortality around the year 1970, against an otherwise steady downwards trend. The deviation from the trend correlates with the calculated strontium concentration in the pregnant women.

Source: Körblein, 2001¹⁴⁶

Radiation harm includes not only cancer and leukaemia, but also reduced immunity and fertility, heart disease, and birth defects including heart defects and other mutations. For example, radioactive contamination of pregnant women in Chelyabinsk, Russia, has resulted in mutations of chromosomes, which have been transmitted through three or four generations.¹⁴⁷

Reproductive health risk from radiation exposure is different for men and women. Men's reproductive health must also be affected by radiation but there is a need for more gender based research in this area.

¹⁴¹ Olson, M., 2011

¹⁴² Körblein A. 2001

¹⁴³ Douglas A., et al., 2007

¹⁴⁴ Körblein A. 2001 and Douglas A., et al., 2007

¹⁴⁵ Kaatsch et al., 2007 and Spix et al, 2007

¹⁴⁶ Körblein A. 2001

¹⁴⁷ Tomsk research quoted in WECF factsheet on nuclear industry and health: www.wecf.eu/english/publications/index.php