INCREASED CHILDHOOD CANCER RATES NEAR NUCLEAR POWER PLANTS
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The closer a child lives to a nuclear power plant, the higher risk it has of developing cancer, particularly leukaemia.

This was proven in 2007 when the so called ‘KiKK’ study (Childhood Cancer near Nuclear Power Plants) was completed. The KiKK study is the most accurate and intense investigation on this issue worldwide. . . . The decision to start the study was taken because the German statistician Dr Alfred Korblein had reanalysed some previous studies which revealed evidence of increased cancer rates near German nuclear facilities (1). Only a persistent . . . campaign by International Physicians for the Prevention of Nuclear War (IPPNW) drove the [German federal office for radiation protection] to prepare a broad research contract and to mandate the Kinderkrebsregister Mainz (KKR) in 2003. The results have been published in the European Journal of Cancer (2), in the International Journal of Cancer (3) and on the website of the Bfs (4) in 2007 and 2008.

The key question of the survey was: Do radioactive isotopes emitted during standard operation of nuclear power plants lead to an increase of childhood cancer rates?

All scientists planning the study design agreed: the substitute value for radiation exposure should be distance from the power plant (5), because it would not be possible to measure exposure directly. The survey was planned to have two parts: case-control with, and without, questionnaire. The timeframe covered 24 years (1980-2003). This ensured the maximum possible amount of data (childhood cancer data had been collected by the KKR since 1980). Altogether, 1592 children with cancer and 4735 controls at all 16 nuclear power sites in Germany were included. The study area consisted of all districts around NPPs, taking into account prevailing wind direction. To rule out misleading interpretation concerning the key question of the first part of the study, the second part (case-control with questionnaire) checked (via standardised forms) if confounders could have influenced the result significantly. It investigated, for example: if mothers before giving birth and fathers before procreation were exposed to radiation; if there had been contacts with insecticides or other toxic substances; if there was a familial clustering or allergies or diseases of the immune system. Even the socioeconomic situation of the families was taken into account. Also: could the emissions of one single plant have distorted the outcome. All these potential confounders were considered, analyzed and ruled out.

The result of ‘KiKK’ is highly significant and proves clearly:

At all 16 sites in Germany, where nuclear power plants operate, children under 5 years of age have a higher risk to develop cancer, particularly leukaemia, the closer they live to the plant. Risk was most increased in a 5 km range around each plant, i.e. 60%. There were 77 diseased children instead of 48 expected statistically. For the leukaemia subdivision, the risk increase was 120%: 37 cases instead of the expected 17. In other words, in the 5 km range, 29 children suffered from cancer (of whom 20 suffered leukemia), just because they lived in these areas.

As the results are highly significant, they cannot be explained by coincidence. The effect is traceable at further distances from reactors, with decreasing clarity. Altogether, there were up to 275 cases more than statistically expected. This ‘negative risk-proximity trend’ persisted throughout: the smaller the distance, the higher the risk.
The results of the KiKK study are in line with other studies.

Over 60 studies of cancer in the vicinity of nuclear power plants (NPPs) have been conducted worldwide. KiKK is the most elaborate. As Dr Ian Fairlie concludes (6), most of the surveys prove increased cancer rates close to nuclear facilities. A standardised meta-analysis by Baker and Hoel (2007) reviewed 17 international studies which showed an increase of cancer and mortality rates close to nuclear sites, not only for children but also for adults (7).

**Now we know:** children living near NPPs have a higher risk to develop cancer; however, we lack a ‘gapless explanation’.

Evidence and simple logic lead to the hypothesis that radioactive emissions released during standard operation of the plants must be considered as causing the excess diseases. This has been the focus of scientific dispute since KiKK was published.

**Radioactive emissions, exposure limits, controls, levelling and corporate secrets:**

Nuclear power plants constantly emit radioactivity via stacks and waste pipes. These emissions may remain within legal limits but the devil is in the detail: Measurements are done by plant operators themselves, and then forwarded to the responsible administrative office (which only controls for measurement accuracy); measurements are infrequent and often incomplete. A further inconsistency is that only arithmetically averaged date are communicated, levelling all peaks and spikes to low mean values. Data are not communicated to universities or scientists because they are treated as corporate secrets.

Meanwhile there is scientific evidence that present assumptions and calculation models concerning radiation risk are wrong and that emission levels derived from them are too high. The official limits must be critically reviewed and adapted. The remarkable peaks which occur when nuclear fuel is exchanged should be reviewed and published separately so they are no longer levelled and averaged. (8)

**Cancer and leukaemia normally occur rarely in children.**

The excess cancers of children living near nuclear facilities likely are established during the embryonic stage. The embryo is extremely radiosensitive. The cells proliferate rapidly and, during mitosis, the cells are much more vulnerable than in stationary phases. Furthermore, the ability to identify and eliminate ‘damaged’ cells evolves later in childhood. An embryo does not yet have these repair mechanisms. Therefore damaged cells can proliferate easily, paving the way for cancer and other diseases.

**NPPs constantly emit radioactive isotopes into the environment (with varying intensity)**

The radionuclides may be incorporated via respiration, water, and food. Most common are tritium (H-3, ‘heavy hydrogen’), radiocarbon (C-14), strontium (Sr-90), iodine (I-131), and plutonium (Pu-239). In a pregnant woman these incorporated isotopes are transported by the bloodstream and the placenta into the embryo and damage it (8).
The biological effects of incorporated isotopes are widely underestimated.

For example, tritium - a source of severe danger - usually is played down by radiation protection authorities. Tritium is an emitter of beta particles with a half-life of 12.3 years. Thus, under constant emission of beta particles, half a given amount of tritium is decayed after 12.3 years.

Compounding with oxygen, tritium easily changes to heavy ‘tritiated water’ (HTO). Plants, animals and humans cannot distinguish between HTO and normal water, H2O. Therefore HTO integrates easily into the structures of cells and DNA (9, 10). Similar pathways exist for other isotopes, e.g. strontium (mistaken for calcium), iodine and plutonium. The presence of isotopes in the body varies with biological half-life periods.

The obsolete models and assumptions of existing radiation protection must be reviewed.

Emissions of radioactivity into the environment are subject to limits based on a calculation model referring to a ‘reference man’, using data collected by the Japanese Radiation Effects Research Foundation (RERF) from Hiroshima and Nagasaki survivors 65 years ago. It is known today that cancer rates after the nuclear bombings were much higher than assumed at that time. Nevertheless, those obsolete data remain in use today as the only ‘scientific’ reference to ‘estimate’ the effects of ionizing radiation. More such errors are described in recently published IPPNW papers concerning the long-term health effects of the Hiroshima and Nagasaki bombs (11, 12). Hiroshima effects were caused by short acting ultra-high-energetic external gamma rays, which are not at all comparable to constant low-level radiation which is mostly internal alpha and beta particle radiation after incorporation of ionising nuclides.

Low-level radiation, not ‘coincidence’, remains the only plausible explanation of the increased cancer rates.

Some scientists think the radiation was too low ‘by a factor of 1000’ and prefer ‘coincidence’ or ‘possibly chance’ explanations. However, taking all facts into account - including the high radiosensitivity of the embryo, the uncertainties of official limits, and the emission peaks during fuel exchange - it is clear the job of ‘factor 1000’ is protection of obsolete measurement charts, official policies and the ongoing operation of nuclear power plants, but not the people.

We need to replace ‘reference man’ with ‘reference embryo’

In 1974, the International Commission for Radiological Protection (ICRP) created the ‘reference man’ - a hypothetical construct of a young healthy white male in North America or Europe, aged 25-30, 154 pounds, 5 feet 7 inches tall - as the basis for existing radiation protection. It is assumed that his immune system is in full working order and his cell repair mechanisms work well. These assumptions do not do justice to the situation of children born in the vicinity of nuclear power plants (13).

IPPNW is petitioning for advanced radiation protection.

Since July 2009, IPPNW has petitioned the German Bundestag to replace the obsolete ‘reference man’ with the more sensitive ‘reference embryo’. By August 2010, 4100 people had signed the petition. The German Bundestag has not responded yet. The petition may be signed on-line: http://www.ippnw.de
Literature


(8) Fairlie I: Childhood cancers near German nuclear power stations: hypothesis to explain the cancer increases. *Medicine, Conflict and Survival, 24:4, 306 (2008)*


(11) IPPNW, Deutsche Sektion: Spätfolgen der Atombombenabwürfe auf Hiroshima und Nagasaki. IPPNW website August 2010, [http://www.ippnw.de](http://www.ippnw.de)
