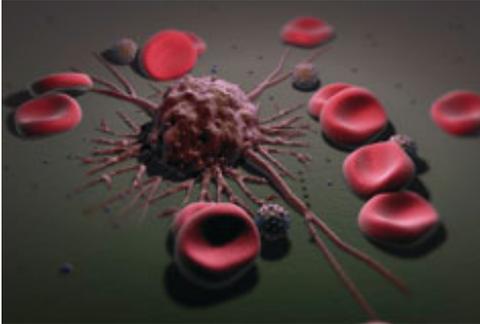


Nuclear safety - an inconvenient maybe

Published on 19 April 2010

By Rebecca Pool



In the rush to build more nuclear power stations, are nations worldwide ignoring proven cancer risks, asks *E&T*.

In December 2007, a team of German epidemiologists reported a 220 per cent increase in leukaemia amongst children living within 5km of nuclear power stations in Germany. They also showed that the closer the children were to each of the 16 reactors, the higher the risk of contracting all types of cancer, especially leukaemia.

The media frenzy and public outcry that followed in Germany was understandable. Whereas previous studies around the world had indicated a possible link between childhood leukaemias and proximity to nuclear power stations, the findings from this research were unequivocal and absolute. What's more, the work was paid for by the German government.

Unlike previous epidemiological studies this research used real data from individual children. As Dr Claudia Spix explains, she and fellow researchers from the German Childhood Cancer Registry spent four years analysing data collected from 1,592 children with cancer and 4,735 children without cancer, all of which were under the age of five and lived within 80km of a nuclear reactor between 1980 and 2003.

Consequently this case-control study, dubbed the 'KiKK study', was expected to yield more reliable results than past 'ecological' studies that had compared cancer incidence rates in an area 5km from a reactor to rates in a region with no reactor. But, despite its credentials, the study hasn't provoked any real action beyond the initial outcry.

On publishing their results, the researchers expressed surprise, even unease, at the findings. Their research papers conclude: 'Based on the available radiation emissions from German nuclear power plants, a direct relation to radiation seems implausible' and 'The results were not to be expected under current radiation-epidemiological knowledge...'

'We weren't entirely surprised by the results due to the results of our earlier ecological studies,' adds Spix. 'But this time there was more data, and given what we know about nuclear power plants, we expected to see a lesser effect. The size of the effect puzzles us.'

Following its publication, the German government immediately appointed independent epidemiologists to validate the KiKK study; they gave it a clean bill of health. As Spix says: 'Basically they said the study has been properly conducted and they don't know [the reason for the observed effect] either.'

Late last year the German government - the Federal Office for Radiation Protection - issued its concluding report on the study. It stated: 'The study was conducted as thoroughly as possible. The findings can be deemed as being sound; independent findings of different groups have confirmed these findings. It can therefore be assumed that the risk of a child, younger than five years, contracting cancer increases the closer [he or she] lives to a nuclear power plant is a fact that has been proven in Germany through the KiKK study as well as in an assessment of the findings by panels of experts.'

Government advice

But, while the government also stressed the need for urgent action to further investigate the causes of childhood leukaemia, it added: 'We cannot recommend parents living in the vicinity of nuclear power plants to move away to another neighbourhood as there is no scientific proof that discharges from a reactor are the sole causes for the diseases.' As it pointed out in the report, based on today's radiation estimates, the slow release of low-range radiation during the routine operation of nuclear power plant would have to be around 1,000 times higher than current levels to account for the increased leukaemia risk.

Independent consultant on radiation risks and a former scientific secretary to the UK government's Committee Examining Radiation Risks from Internal Emitters (CERRIE), Dr Ian Fairlie, is incensed by the German government's response. 'This study was commissioned by the German government, was carried out by a crack team of epidemiologists, is probably the best epidemiological study I've seen and came out with absolutely unequivocal findings,' he asserts. 'However, the study is a real embarrassment to the nuclear industry and their reaction has been: 'hear no evil, see no evil and do no evil'. The German government stands by the results but is not doing anything. I would say that if this was any other toxic agent, already there would have been warning signs up and

advice given to local populations.'

Fairlie questions the reliability of official radiation risk estimates, which are used the world over to assess radiation risk, and were employed by the KiKK authors when drawing their puzzled conclusions. These risks are derived from the Japanese survivors of the atomic bombs in 1945, and as such, are considered by many to provide unsatisfactory datasets.

As Fairlie poses the question: should scientists be using the risks estimated from a sudden external blast of high energy neutrons and gamma rays when assessing the radiation risks from ongoing, slow, environmental releases from nuclear power plant?

Fairlie also queries existing 'dose limits', which provide guidelines as to what is a safe dose of radiation for the public to receive. 'Published radiation doses to members of the public near nuclear power plants are invariably very low, and these are estimates, not measurements,' he says. 'To estimate these doses is very complicated... and uncertainties can be very large, as recognised by CERRIE and other committees.'

Fairlie also points to recently discovered effects of radiation - hotly discussed by radiation biologists around the world - that can take place after very low doses of radiation and are therefore not factored into present-day safe-dose limits (See box 'The Explanation?'). 'Official dose estimates are not necessarily incorrect... but when we examine the possible reasons for the wide gulf between estimated risk and the risks observed by the KiKK study, we should not dismiss radiation exposures as a possible cause because of low official dose estimates,' he cautions. 'Most radiation protection people admit, albeit not in public, that dose estimates could be wrong.'

The German government's independent epidemiologists had noted the KiKK authors' reluctance to relate the increased incidence of cancers to radiation based on current risk and dose estimates, and went on to evaluate current knowledge on radiation effects. After investigations the team concurred that radiation exposures from the German nuclear power plant would be too low to cause the higher cancer risks. In response, Fairlie published a list of ten omissions in their research alongside the statement: 'The [team] simply didn't examine the matter.'

Unexpected silence

Fairlie has also expressed surprise over lack of response to the KiKK study from the rest of the world. 'When the study was first published in Germany there were newspaper articles and TV programmes. But while it was widely discussed in Germany, and also discussed in Sweden, Switzerland and Austria, there was barely a flicker in any other country,' he says. 'I think the official agencies are playing dumb on this, they are not discussing it despite the fact it should be discussed.'

But, while the results of the KiKK study may not have reached widespread public audience beyond Germany, the results spawned similar studies in several other countries. For example, in August 2008, French epidemiologists published a paper, 'Childhood leukaemia incidence below the age of five years near French nuclear power plants'. The ecological study identified a small increase in child leukaemias which was described as 'not statistically significant'.

Likewise, in August 2008, British scientists from the Childhood Cancer Research Group at Oxford University published results from an ecological study, prompted by the KiKK study. Like the French report, slight, but not statistically significant, increases were noted.

This study also highlighted how the KiKK study contradicted work carried out by the Committee on the Medical Aspects of Radiation in the Environment (COMARE), a group set up by UK government to assess and advise on the health effects of natural and manmade radiation.

Dr John Bithell, an honorary research fellow at Oxford's Childhood Cancer Research Group as well as COMARE committee member, co-authored the British paper and most recent COMARE report. He agrees that case-control studies, such as the KiKK report, can deliver more reliable results than ecological surveys, but also highlights potential flaws. 'The trouble with case-control studies is you can get a bias [towards the case studies] because the way the control group behaves is not identical to the way the case studies behave,' he says.

As he points out, a parent that has had a child with leukaemia might be more helpful to an interviewer than a typical busy parent. 'I am suspicious, and it has been admitted by the [KiKK] researchers that the controls didn't always agree to be interviewed. This could give you biased results,' he adds.

As well as questioning the methodology behind the KiKK study, he also doubts that radiation from nuclear power plants is the cause of raised cancer risks in children living near to these installations. 'We believe socio-economic status to be the most important factor, and it is actually the better-off families that are more likely to have children with leukaemia,' he says.

Indeed, Bithell is in the process of incorporating socio-economic status in his analyses and soon plans to publish his results. '[Including] socio-economic status in a study will reduce the apparent effect of living near to a nuclear power plant as these more rural areas tend to be inhabited by the wealthier,' he explains. 'There is no doubt in my mind that this is the most important factor.'

Industry voice

So what has the nuclear industry made of the KiKK study? Ian Hore-Lacy, director of communications of the World Nuclear Association, asserts that the industry observes the science carefully, listens to the arguments and keeps its doses very low. He also believes the KiKK study needs to be 'put into context'.

'Leukaemia clusters have been found in the vicinity of nuclear power plant and elsewhere, but no correlation or causative effect has ever been found,' he says. 'The author[s] of this paper [are] notorious for manipulating data and making things look bad. You would get more radiation from living in Cornwall than living on top of a nuclear power plant.'

Dr Claudia Spix and her colleagues are well aware of their critics. 'We've heard unfriendly things from the energy providers who were unhappy with the study and equally unfriendly things from the anti-nuclear power lobbies that were unhappy with our conclusions,' she says.

However, amid the controversy, and two years after the publication of the KiKK study, Spix is still scrutinising her results, although this time without government funding. She says she has heard the doubts from Bithell, and others, on cooperation from their control group and states: 'We did some sensitivity analysis on this issue and didn't find a bias.'

'We have been doing a lot of thinking along the lines of might the results have been caused by a methodological problem,' she continues. 'Other people have come forward with loads of ideas, some feasible, some less feasible.'

In a paper soon to be published Spix explores suggestions from fellow researchers, attempting to explain her unexpected results. Still, when asked if the paper will provide an explanation, she replies: 'Afraid not.'

'Since the publication of our research I have given many talks on the topic,' she adds. 'My final transparency is always a big question-mark.'

Further information

- [World Nuclear Association](#)
- [Committee on Medical Aspects of Radiation in the Environment](#)
- [German Commission on Radiological Protection](#)
- [German Childhood Cancer Registry](#)

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