Leukaemia cases linked to fathers' radiation dose

- Environmental effects ruled out
- Government inquiry to begin

London

AN excess of childhood leukaemia cases in the village of Seascale, near British Nuclear Fuels' (BNFL's) Sellafield nuclear waste reprocessing plant, is linked in a report published last week to high radiation doses received by workers at the plant before their children's conception.

The association now reported is the first of its kind to be recorded in humans, although there have previously been reports that male and female experimental animals irradiated before mating produce damaged offspring. The occurrence of childhood leukaemia around Sellafield has been a matter of public concern since 1984, when the region was recognized as one of several in which there have been 'clusters' of childhood leukaemia cases.

The UK Department of Health, responding promptly to the findings published last week, has referred the study for "urgent consideration" by the Committee on Medical Aspects of Radiation in the Environment (COMARE), an independent scientific group which advises the government.

A research team led by Professor Martin Gardner, from the University of Southampton, looked at 52 cases of leukaemia and 22 of non-Hodgkin's lymphoma in the Sellafield area, diagnosed between 1950 and 1985, for statistical links to various factors thought to increase the risk of leukaemia.

By comparing the 74 cases with 1,001 healthy people taken from the same birth registers, Gardner and his colleagues ruled out environmental discharge of radiation from Sellafield as the culprit. Although there was some evidence for a connection between the children's leukaemia and their mothers' exposure to X-rays or viral infections during pregnancy, only their fathers' exposure to radiation while working at Sellafield can explain the tenfold excess in leukaemia cases at Seascale, says Gardner.

Gardner's results, published in the *British Medical Journal**, show that children were seven to eight times more likely to develop leukaemia if their fathers had received a total radiation dose of 100 milli-Sieverts (mSv), or more than 10 mSv in the six months before conception. Radiation doses were found from film badges worn by all BNFL radiation workers.

This is the first time that childhood leukaemia has been linked to fathers' occupational radiation exposure. A Japanese study (see *Nature* 296, 575; 1982) showing that male mice exposed to radiation father offspring are more likely to develop cancer has not previously been thought to have much bearing on human leukaemia, because it is contradicted by data gathered among Japanese atomic bomb survivors.

Those data show no excess of leukaemia cases among the children of the atomic bomb survivors. Although survivors of Hiroshima and Nagasaki suffered much greater radiation exposure than anyone at Sellafield, Gardner now suggests that the difference between the two groups may be explained by differences in the physiological effects of a single large exposure and the accumulation of lower-level radiation doses.

Nevertheless, some radiation scientists believe the Hiroshima and Nagasaki results weigh against Gardner's interpretation. Richard Doll, from the Imperial Cancer Research Fund's laboratory in Oxford, doubts whether radiation is the true explanation for the high leukaemia incidence at Sellafield, and suggests that occupational exposure to chemicals, happening to correlate with radiation dosage, may be involved. But Doll is pleased that Gardner's results focus attention on occupational exposure to radiation, rather than environmental discharges. The paper "takes the heat out of concern over radioactive waste in the environment", he says.

COMARE will consider the Sellafield results along with those from similar studies, now under way in the Dounreay area of Scotland (the site of BNFL's other reprocessing plant) and around the Ministry of Defence atomic weapons research establishments at Aldermaston and Burghfield. These will report at the end of 1990, or early next year.

Gardner's team is also planning further studies at Sellafield, relating fathers' occupational radiation exposure to leukaemia and other cancers for a much larger cohort of children born in the area. Unlike the present study, this will include children who moved away from Sellafield. Gardner is also looking at leukaemia rates in children born before 1952, when the Sellafield plant opened.

The new findings are a blow to BNFL, which already faces legal action from several parents of children with leukaemia from the Sellafield area. After discussing

"Spinning pulsar" claims retracted

New Orleans

ASTRONOMERS who last year reported a pulsar that was apparently rotating at an unheard of rate of nearly 2,000 times a second have discovered an experimental error in their data that could negate the results. Speaking at the annual meeting of the American Association for the Advancement of Science this week, John Middle-ditch, an astronomer at the Los Alamos National Laboratory, said that interference from a video camera may have caused the spurious data. The pulsar's perceived rotational frequency of 1968.63 Hz corresponds to a characteristic video frequency.

Signals indicating the apparent pulsar had been spotted only once in the debris left after supernova 1987A (see *Nature* 338, 234-236; 1989), but subsequent statistical analysis of the data seemed to confirm the event. Such a quickly spinning pulsar would defy conventional theory and has sparked a number of new proposals in the hope of explaining it.

G. Christopher Anderson

the new results with Gardner, the company is to set up a joint investigation at Sellafield with the Health and Safety Executive's Nuclear Installations Inspectorate, which is expected to look at 'internal' radiation doses — radiation actually taken into the body, rather than external measures taken from badges attached to employees' work clothes. The internal exposure can be calculated retrospectively, using the known half-lives of radioactive isotopes. Occupational exposure to chemicals may also be studied.

In the meantime, BNFL says its medical officers will counsel any of the Sellafield workforce who are worried by Gardner's results. They also stress that they have taken measures to reduce their workers' exposure to radiation. The present UK legal limit for occupational exposure is 50 mSv per year, but the National Radiological Protection Board recommended in 1987 that doses should be kept below an average of 15 mSv per year wherever possible.

In 1988, 402 of the Sellafield workforce received more than 15 mSv, fewer than half the number in 1987. But Gardner's results have already led to calls for BNFL to take further action to reduce radiation exposure. Unions representing the Sellafield workers are to meet with Gardner and BNFL management during the next week. Bill Brett, general secretary of the Institution of Professionals, Managers and Specialists, which represents the majority of BNFL's radiation workers, says "there must be prompt examination of current radiation dose limits and further action to protect all employees".

Peter Aldhous

*Results of case-control study of leukaemia and lymphoma among young people near Sellafield nuclear plant in West Cumbria. Gardner, M.J., Snee, M.P., Hall, A.J., Powell, C.A., Downes, S. & Terrell, J.D. *Brit. med. J.* 300, 423-429 (1990).