

## **Childhood Leukaemia Around the French Nuclear Reprocessing Plant (La Hague): The On-Going Research**

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La Hague, together with Sellafield and Dounreay, is one of the three nuclear waste reprocessing plants, operating on an industrial scale in the world. Following the hypothesis generated by Sellafield reports, spatial mortality and incidence survey have been carried out in the La Hague vicinity. A first mortality study has been reported in 1990 for the time period 1968-1986 [1]. There was no evidence of mortality excess neither in 3 age groups (0-4 years, 5-14 years, 15-24 years), nor in 3 areas within a specified radius of the nuclear plant (10 km, 20 km, 35 km), nor in two time periods (1968-78 and 1979-86).

The incidence of leukaemia was then examined in the same age groups and areas [2]. During the time period 1978-90, a total of 23 cases was diagnosed, giving an incidence rate of 2.99 per 100,000 which was close to the expected rate. In the electoral ward in which the nuclear plant is located ('canton de Beaumont-Hague'), 3 cases of leukaemia were observed compared with 1.2 expected, giving a standardized incidence ratio of 2.5. This non-significant finding was compatible with no increased risk and also with a sevenfold excess risk.

We have then extended the incidence study period (up to 1992), and checked the sensitivity of the results to the choice of disease clustering tests and reference rates [3]. The performance of three statistical procedures were compared: a conventional approach, a Poisson maximum test, and an extraction mapping-technique. On the whole, the results were in general agreement and demonstrated the apparent existence of a di-

stinct cluster of childhood leukaemia, contiguous and south-east of the La Hague nuclear facility. The standardized incidence ratio in the 'canton de Beaumont-Hague' was 2.8 (95 % CI 0.8 - 7.2).

To confirm these results, we have then looked at individual risk factors by a case-control study. The study population comprises 27 cases and 192 controls. The latters were identified by the general practitioners (GPs) from the study area. GPs were asked to prospectively select the first ten parents who had a child fulfilling the matching criteria with the index case, to check at the end of each week if among their outpatients they had missed some potential controls, and if so to get in touch and convince them to enter the study. Controls were matched to cases on gender, age, place of birth and place of residence at time of leukaemia diagnosis of the corresponding case. Two trained interviewers administered lengthy and detailed in-person-interviews in the parents' home. They used a detailed structured questionnaire mainly inspired by the Gardner's as well as the UK case-control study of childhood cancer questionnaires, but adapted to the local context. The questionnaire, developed and tested during a pilot phase, focused on mother's and child's characteristics on one hand, and on father's characteristics on the other. It was used to gather information on socio-demographic data, basic medical history and residential history of parents, lifestyle, occupational exposures of parents before the children's conception, during pregnancy, and after birth, including specific questions about

employment at nuclear establishments. The questionnaire sought data about antenatal exposure to X-rays, viral infections, drug treatments during pregnancy with the index child, child's residences, lifestyle (including recreational activities on beaches, local vegetables consumption, exposure to electromagnetic fields...) up to the date of diagnosis. The form was also concerned with childhood viral infections and childhood X-ray exposure. It inquired about additional items on other pregnancies and children in the family. Questionnaires were compiled centrally, and reviewed for completeness and accuracy.

Radiation dosimetry for parents employed at Cogema-La Hague, EDF-Flamanville or the Navy dockyards of Cherbourg were obtained from occupational medical officers who were blind to the children's status. Radiation details were available in the form of external whole body ionising radiation dosimetry in millisieverts (mSv). This research protocol has passed scientific peer review from the French Medical Research Institute (INSERM) and an ethical agreement from the French 'Commission Informatique et Liberté' (French National Committee for Data Processing and Freedom) was obtained. These data are currently under analysis, and the results should be made publicly available in the near future.

### References

1. Viel JF, Richardson ST. Childhood leukaemia around the La Hague nuclear waste reprocessing plant. *BMJ* 1990;300:580-581.
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3. Viel JF, Pobel D, Carré A. Incidence of leukaemia in young people around La Hague nuclear waste reprocessing plant : a sensitivity analysis. *Stat Med* 1995;14:2459-2472.