



Health Protection Agency

NRPB Press Releases

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Serious Radiological Incident in Turkey

14 January 1999

The IAEA and WHO have asked NRPB to provide medical assistance to the Turkish authorities following a radiation accident. Preliminary information suggests that 16 persons were exposed to radiation from a 15 TBq (400 Ci) cobalt-60 source at a scrap metal yard. All the people have been hospitalized in Turkey. Two of the patients were exposed, according to preliminary evaluation, to a dose of around 5 Gy each, and three others are thought to have had similarly high doses. Five patients appear to have received doses less than 3 Gy, and the remaining six patients (including five children) less than 1 Gy. As a result of NRPB membership of the WHO Radiation Emergency Medical Preparedness Assistance Network (REMPAN), Dr Chris Sharp, medical consultant from NRPB, has been asked to help and he has travelled to Istanbul. He and another member of REMPAN, Professor Jean-Marc Cosset of the Curie Institute in France, will work with their Turkish medical colleagues. They have also asked that NRPB give assistance in cytogenetics and Dr David Lloyd, head of the NRPB Cytogenetics Group, will carry this out. Cytogenetic analyses enable a retrospective assessment of doses to be made. This can help in planning the optimum medical treatments for patients who have received high doses of radiation. NRPB has made these arrangements with the IAEA, Vienna.

Background Information on REMPAN

For many years, WHO has been collecting and distributing health information on cases of overexposure to ionising radiation and on techniques for diagnosis and treatment of casualties. WHO recommendations based on analysis of this information have assisted health authorities in the improvement of emergency medical preparedness and assistance at the local, national and international level. In carrying out these activities, WHO has collaborated closely with the IAEA, UNSCEAR, ICRP, ILO and other international bodies as well as with national institutions. The Chernobyl accident gave a strong new impulse for further development of WHO activities in the field of radiation emergency medical preparedness. In 1988, WHO took a decision to accede to the convention on early notification of a nuclear accident and to the convention on assistance in the case of a nuclear accident or radiological emergency. The specific role of WHO in the family of UN organisations is to address aspects directly relevant to the medical community and health authorities in member states. WHO has established REMPAN for the promotion of radiation emergency medical preparedness and for practical assistance and advice to countries in a case of overexposure from any source of radiation.

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Possible Health Effects from the Use of Mobile Phones

5 March 1999

In light of recent articles in the news media (*Sunday Times*, 28 February 1999 and *Daily Mail*, 1 March 1999), NRPB would like to draw attention to the following statements from the United Bristol Healthcare NHS Trust and the University of Bristol (1 March 1999), and the University of Oxford (4 March 1999).

The United Bristol Healthcare NHS Trust and the University of Bristol

Research into Mobile Phones - Dr Alan Preece

Dr Alan Preece wishes to make clear that the [articles](#) about his research into the effects of using mobile phones published by the *Sunday Times* ('Top scientists give up "risky" mobile phones', 28 February) and the *Daily Mail* ('Loss of memory link to mobile phones', March) are substantially inaccurate. The articles are not based on the research findings Dr Preece has submitted for publication in the *International Journal of Radiation Biology*. The findings are strictly embargoed until 8 April 1999. Dr Preece is not available for interview until that date.

Issued by the press offices of UBHT and the University of Bristol:

Telephone: 44 (0)117 928 3629

University of Oxford

Risk from the Use of Mobile Phones - Professor Colin Blakemore

Colin Blakemore, FRS, Professor of Physiology at the University of Oxford, and a member of the Advisory Group on Non-Ionising Radiation (AGNIR) of the National Radiological Protection Board (NRPB), wishes to correct recent reports of his opinion of the risk from mobile phones. Professor Blakemore said:

An article in the *Sunday Times* (28 February) was selective in its account of views that I expressed, and a subsequent report in the *Daily Mail* (1 March), for which I was not interviewed, significantly misrepresented my opinion.

Professor Blakemore said that he had read earlier newspaper stories about a study by Dr Alan Preece at Bristol Royal Infirmary, but he had not seen the scientific report, which has not yet been published, and therefore could not comment on its significance. He notes that Dr Preece has issued a press release stating that the comments attributed to him were 'substantially inaccurate'. Professor Blakemore said that he had never suffered headaches after using a mobile phone, but that he had found telephone conversations distracting, which is a strong reason to avoid the use of mobile phones while driving. When asked whether he tries to limit his use of his

mobile phone he said that he does, 'because it is very annoying to other people and it's expensive.' He added:

The anecdotal impressions of scientists are no more important than those of anyone else. What is needed is further research, as indicated in recent advice from NRPB and AGNIR.

Issued by the press office of the University of Oxford:

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Nuclear Industry Family Study

28 May 1999

A new study suggests that the incidence of cancer and leukaemia among the children of workers in three parts of the nuclear industry is similar to that in the general population.

The incidence of leukaemia in young people living near nuclear installations has been the subject of much research. The Nuclear Industry Family Study (NIFS) was set up to investigate the health of children of workers at three organisations in the nuclear industry: the Atomic Weapons Establishment (AWE), British Nuclear Fuels plc (BNFL) and the UK Atomic Energy Authority (UKAEA).

Researchers from the Leukaemia Research Fund, the London School and Hygiene and Tropical Medicine, and the Imperial Cancer Research Fund have just published the findings for cancer in NIFS ^{1,2}. Among just under 40,000 children of male workers and approaching 9000 children of female workers, the overall incidence of cancer and leukaemia in particular was similar to that in the general population. Among the children of men monitored for radiation exposure prior to the child's conception, no statistically significant trends were found between increasing radiation dose and leukaemia. Whilst the authors reported indications of a raised leukaemia rate among the children of men with a total dose prior to conception of 100 mSv or more, this was based on only three cases. Furthermore, after excluding children born in Cumbria which could have been in the study (by Gardner and colleagues ³) that originally suggested an association between leukaemia and paternal preconception radiation exposure, there was only one leukaemia case with a pre-conception dose of at least 100 mSv.

Cancer among the children of radiation workers was previously studied by NRPB in conjunction with the Childhood Cancer Research Group (University of Oxford), the University of Birmingham and the Cancer Research Campaign's Cancer Epidemiology Research Group (University of Oxford). These groups conducted a national study in which records of childhood cancer cases and controls were linked to data for radiation workers ⁴. This study was based solely on existing registers whereas NIFS relied on responses to surveys. The Record Linkage Study was therefore not susceptible to possible response bias, but the design of NIFS does allow a wider range of issues to be addressed. The Record Linkage Study encompassed not only the three organisations considered in NIFS (namely, AWE, BNFL and the UKAEA) but also other employers with large numbers of workers. Even when restricted to these three organisations, the Record Linkage Study covered more workers than did NIFS. In particular, fewer childhood cancer cases with fathers who were monitored radiation workers were identified in NIFS than in the corresponding part of the Record Linkage Study (22 and 60 cases respectively).

NRPB considers that the results from NIFS do not affect the advice issued after the publication of the Record Linkage Study; namely, that there is no reliable evidence that paternal preconception irradiation is a cause of leukaemia or of other cancers in the offspring of radiation workers.

1 Roman, E, Doyle, P, Maconchie, N et al. Cancer in children of nuclear industry employees: report on children aged under 25 years from nuclear industry family study. *Br. Med J.*, **318**, 1443-50 (1999).

2 Maconchie, N, Doyle, P, Roman, E et al. The nuclear industry family study: linkage of occupational exposures to reproduction and child health. *Br. Med J.*, **318**, 1453-4 (1999).

3 Gardner, M J, Snee, M P, Hall, A J et al. Results of case-control study of leukaemia and lymphoma among young people near Sellafield nuclear plant in West Cumbria. *Br. Med J.*, **300**, 423-9 (1990).

4 Draper, G J, Little, M P, Sorahan, T et al. Cancer in the children of radiation workers: a record linkage study. *Br. Med J.*, **315**, 1181-8 (1997).

Safety of Visual Display Units

16 July 1999

There are reports in the news media (for example, the *Daily Mail*, 'Do computers make you ill?' 14 July 1999) about a study which claims to show that people who use visual display units (VDUs) experience various deleterious symptoms which can be relieved by a device which can be fitted to a VDU screen. Other than its price, there is no precise information in the reports about the device or how it works.

The study referred to in press reports has not been published in scientific or medical journals. A few months ago a group of Fellows of the Royal Society published advice ¹ to scientists about talking to the media before the publication of results in peer review journals:

It is a dangerous mistake... to assume that all statements claiming to be scientific can be taken at face value. Good science is work that has stood up to detailed scrutiny by independent workers in the field and contributes to new knowledge and understanding. Those who start telling the media about alleged scientific results that have not first been thoroughly scrutinised and exposed to the scientific community serve only to mislead, with potentially very damaging consequences.

This advice is very relevant to this case. Furthermore, it is particularly appropriate when a commercial interest is involved.

Advice by NRPB is based primarily on good scientific or medical research in peer review journals and information related to the safety of VDUs is kept under review. The Board's Advisory Group on Non-Ionising Radiation (AGNIR) has previously studied this subject in detail ². It concluded that exposure to radiation resulting from the use of VDUs causes no significant adverse health effects. In particular, work with VDUs does not appear to influence the formation of cataracts, there is no evidence of any harm to the developing fetus of female workers, and they do not appear to cause skin diseases. Existing skin conditions may, however, be aggravated in conditions of low humidity.

Since the publication of the report on VDUs, no research published in peer reviewed journals has led to a change in these conclusions. NRPB has measured emissions from VDUs on many occasions and exposure of operators has always been well within the guideline levels recommended by NRPB. There is no evidence of a hazard from the electromagnetic fields produced by modern VDUs and TV monitors, and therefore we do not see the need for devices which claim to reduce such fields.

Most health problems arising from the use of VDUs are related to posture, lighting problems and working practices. Guidance on the Health and Safety (Display Screen Equipment) Regulations 1992 has been given by the Health and Safety Executive ³.

1 Letter from a group of Fellows at the Royal Society. The mis-appliance of science. *The Guardian*, 23 February 1999 (see also the website of The Royal Society).

2 [Health Effects Related to the Use of Visual Display Units](#). *Doc. NRPB*, **5**, No. 2 (1994).

3 Display screen equipment work. *Guidance on Regulations*. L26, London, The Stationary Office (1992).

Stillbirths and Exposure to Radiation

22 October 1999

The study by Parker et al. ¹ reports an apparent dose-related increase in frequency of stillbirth in the children of male radiation workers at the Sellafield reprocessing plant. The study is subject to uncertainty and the conclusions are inconsistent with other human data on radiation induced genetic effects.

The paper by Parker et al. (1999) describes a cohort and case control study of 248,097 live births and 3,715 stillbirths in Cumbria during the period 1950-1989. Of this total, 9,078 live births and 130 stillbirths were to partners of male workers employed at Sellafield. The paper finds a significant positive association between the risk of a baby being stillborn and the father's total pre-conception exposure to external ionising radiation. The risks for stillbirth with congenital abnormalities were higher, particularly for neural tube defects. During the 39 year period of the study, the stillbirth rate in Cumbria fell from 22.3 to 5.8 per 1000 live births reflecting, amongst other things, improved diet and medical care over the period. This large decrease in risk illustrates the importance of taking account of non-genetic factors in the study of stillbirths and congenital abnormality. Some of these factors were taken into account in the study by Parker et al., but maternal life style factors are particularly relevant and were not taken into account.

There is some evidence from animal and biological studies of genetic risks from radiation exposure, but it is not possible to make quantitative extrapolation to humans. The children of Japanese A-bomb survivors provide the most important source of evidence and there is no statistically significant relationship between dose and either stillbirths or neural tube defects in the Japanese cohort. Furthermore, the findings of Parker et al. do not accord with the absence of an excess of heritable effects in the children of parents who had cancer treatment with high dose radiation and/or chemotherapeutic agents prior to conception. A study of birth outcomes relating to the Hanford nuclear site in the USA cited by Parker et al. (1999) provides only weak epidemiological support for their findings.

In conclusion, the study by Parker et al. (1999) suggests an association between stillbirth and pre-conception irradiation of fathers at the Sellafield nuclear plant. The findings of the study appear to be driven by a small number of fathers with the highest doses, and the main conclusion is subject to uncertainties. Also, the findings are inconsistent with other human data on radiation-induced genetic effects. This study does not therefore change NRPB advice on risk factors for radiation-induced genetic effects. The uncertainties and lack of compatibility with other studies suggest that the data of Parker et al. (1999) should not be taken as evidence of a causal genetic association between excess stillbirths and paternal irradiation at the Sellafield plant.

1 Parker, L, Pearce, M S, Dickinson, H O, Aitkin, M, and Craft, A W. Stillbirths among the offspring of male radiation workers at Sellafield nuclear reprocessing plant. *Lancet*, **354**, 1407 (1999).

Notes for editors

Stillbirths among the offspring of male radiation workers at the Sellafield nuclear reprocessing plant (L Parker et al.)

This study was based on a survey of 248,097 singleton live births and 3,715 stillbirths in Cumbria over the period 1950-1989. Of these, 130 stillbirths and 9,078 live births were to partners of men who had been radiation workers at Sellafield before conception.

There was a statistically significant increasing trend in stillbirth risk with preconception dose, using both cohort and nested case-control epidemiological analyses. For the cohort study, the relative risk of stillbirth following 100 mSv total external pre-conception dose was estimated to be increased by 24% (RR = 1.24; 95% confidence interval 1.04-1.45, 1 sided p=0.009). The radiation-associated risks were judged to be greatest for stillbirths with neural tube defects. Furthermore, the statistical models predicted that, if these associations were causal, between 0 and 32 of the 130 stillbirths to partners of the Sellafield workforce might be attributed to radiation exposure of the father.

A large number of variables relating to mothers and fathers should be considered in the interpretation of this study. In addition to the paternal doses, the main variables are year of birth, paternal age, social class and birth order. The authors attempted to adjust for these latter variables in the cohort analysis of all stillbirths. However, there are uncertainties and possible biases in the estimation of some demographic variables that may have led to bias in the estimates and to the confidence intervals being artificially narrowed. It is also unclear whether that subset of stillbirths involving neural tube defects was chosen a priori; in any event, their frequency was not adjusted for these demographic variables in the cohort analysis, and they were not reported upon in the case-control analysis. Maternal factors, particularly age at conception and diet, are known to strongly influence birth outcomes. In illustration of this, a Medical Research Council study (MRC 1991 ¹) showed that around 70% of neural tube defects in offspring could be prevented by a folic acid supplement to maternal diet. Parker et al. did not adjust for any maternal factors.

There is potential confounding between temporal trends in the background rate of stillbirths and doses to the fathers. These background rates fell by a factor of 4 during the 39 year study period, while preconception doses tended to be highest during the first 20 years. This fall by a factor of 4 in background rate needs to be viewed against a relative risk of 1.24 at 100 mSv. The analysis thus requires correction for factors that are much more powerful than the reported effect of radiation (about 16 times more powerful at 100 mSv). These corrections are incomplete for the cohort study and this must call into question the reliability of the positive trend with dose reported by Parker et al. Furthermore, if the single stillbirth having the highest preconception dose (~ 900 mSv) is excluded, the trend estimate becomes of only borderline significance.

There are also unresolved uncertainties in some of the estimates of preconception dose. In particular, the derivation of the 90-day preconception dose in the cohort analysis - by pro-rata scaling of the annual dose summaries - may have led to substantial errors as the authors suggest. The significant trend in stillbirth risk with this dose measure in the cohort analysis should be contrasted with the non-significant trend in the case-control analysis, for which the 90-day preconception dose is likely to have been assessed more accurately.

Comparison with other studies

Parker et al. draw comparisons with the results of genetic studies on the children of Japanese A-bomb survivors. Unlike the Parker et al. study, however, there is no statistically significant relationship between dose and either stillbirth or neural tube defects in the Japanese cohort (Neel and Schull 1991 ²).

Contrary to the conclusions of Parker et al., NRPB calculations show that the data they present are statistically incompatible with those from Japan. The suggestion by Parker et al. that their results are compatible with those from the A-bomb survivors is based on a threshold model, which is biologically implausible.

Parker et al. also cite data on neural tube defects in children of exposed workers at the Hanford site in the USA (Sever et al. 1988 ³). This finding was based on only 11 cases and was part of a larger study of 11 other birth outcomes. Sever et al. (1988) were inclined to regard this positive association with dose for neural tube defects as a chance finding. These data therefore provide only weak epidemiological support for the conclusions of Parker et al.

The central estimate of risk from the study of Parker et al. might be viewed as evidence of discernible human genetic effects at relatively low radiation doses. However, this is supported by neither the A-bomb data, nor by studies on the children of parents who had cancer treatment with high dose radiation and/or chemotherapeutic agents. None of these latter studies has reported evidence of the induction of heritable damage (Byrne 1999 ⁴).

Animal studies have established the principle that congenital abnormalities are inducible by radiation (UNSCEAR 1993 ⁵; NRPB 1993 ⁶) but it is not possible to make quantitative extrapolation to humans. However, work published recently in conjunction with a task group of the International Commission on Radiological Protection (Denniston 1998 ⁷, ICRP 1999 ⁸) concludes that the frequency of development of multifactorial disorders having environmental and genetic components, such as congenital abnormalities, will be poorly responsive to new mutations induced by radiation. This view is consistent with the relatively small genetic component that applies to human congenital abnormalities (Baird et al. 1988 ⁹, Czeizel 1993 ¹⁰) and the essentially negative results from the A-bomb and cancer survivor genetic studies.

1 MRC. Medical Research Council Vitamin Study Research Group. Prevention of neural tube defects: Results of the MRC vitamin study. *Lancet*, **338**, 131-7 (1991).

- 2** Neel, J V, Schull, W J (eds). The children of atomic bomb survivors: A genetic study. National Academy Press, Washington, DC (1991).
- 3** Sever, L E, Gilbert, E S, Hessol, N A and McIntyre, J M. A case-control study of congenital malformations and occupational exposure to low-level ionising radiation. *Am. J. Epidemiol.*, **127**, 226-42 (1988).
- 4** Byrne, J. Long-term genetic and reproductive effects of ionising radiation and chemotherapeutic agents on cancer patients and their offspring. *Teratology*, **59**, 210-5 (1999).
- 5** UNSCEAR. 1993 report of the General Assembly, with scientific annexes: Sources and effects of ionising radiation. United Nations, New York (1993).
- 6** NRPB. Board statement on diagnostic medical exposures to ionising radiation during pregnancy and estimates of late radiation risks to the UK population. *Doc. NRPB*, **4**, No. 4 (1993).
- 7** Denniston, C, Chakraborty, R and Sankaranarayanan, K. Ionising radiation and genetic risks. VIII, The concept of mutation component and its use in risk estimation for multifactorial diseases. *Mutation Res.*, **405**, 57-79 (1998).
- 8** ICRP. Task Group report on risk estimation for multifactorial diseases. *Ann. ICRP* (adopted for publication 1999).
- 9** Baird, P A, Anderson, T W, Newcombe, H B et al. Genetic disorders in children and young adults: A population study. *Am. J. Hum. Genet.*, **42**, 677-93 (1988).
- 10** Czeizel, A. What proportion of congenital abnormalities can be prevented? *Br. Med. J.*, **306**, 499-503 (1993).

Fire at a Royal Ordnance Factory

12 December 1999

On Monday morning, 8 February, a fire occurred at a Royal Ordnance Speciality Metals factory at Featherstone in Staffordshire. The factory handles depleted uranium and there was initial concern that the fire could have led to a release of radioactivity. The emergency services therefore advised local residents to stay indoors and close the windows.

Staff from NRPB Northern Centre in Leeds carried out monitoring at the factory in conjunction with Royal Ordnance and the Environment Agency. Measurements to date indicate that there has been no dispersion of radioactive material beyond the building in which the fire took place. NRPB is satisfied that the public were not exposed to radiation as a consequence of this incident.