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Lung cancer risk due to radon in dwellings - results of a European study

Epidemiological studies previously carried out in Europe, North America and China have consistently shown an increased lung cancer risk due to radon in dwellings. The significance of single studies, however, is frequently restricted because of the number of samples. With financial support of the European Commission the original data of all studies so far carried out in Europe were therefore combined and jointly evaluated. The results were recently published in the British Medical Journal.

The evaluation comprised thirteen studies from nine countries. The study coordination and the statistical evaluation were done in Oxford under the direction of Prof. Sarah Darby. On the German part, the Federal Office for Radiation Protection, the GSF Institute for Epidemiology in Neuherberg and the Hanover Veterinarian University were involved. Altogether 7,148 lung cancer patients and 14,208 control persons without this disease were investigated in the study. Among the studies there were two comprehensive investigations supported by the Federal Office for Radiation Protection.

In the dwellings of the study participants which had been inhabited for 5 to 35 years prior to the interview or the diagnosis the radon concentration was measured over a period of at least half a year. Additionally, all test persons were questioned in detail as to their life-long smoking behaviour and other lung cancer risk factors. For each test person the time-weighted mean value of the radon concentrations in Becquerel per cubic metre (Bq/m³) of the

dwellings inhabited during the last 5 to 35 years was calculated. In all risk analyses smoking was considered as the most important disturbance variable.

The study shows a clear exposure-effect-interrelation between radon and lung cancer which can best be described via a linear model without threshold value. The lung cancer risk increases by 8.4 % per increase in radon concentration of 100 Bq/m³. If one takes additionally into account the uncertainties in the exposure estimation, the risk increases from 8.4 % to 16 %. This means, for instance, that a person who lives in a dwelling with a radon concentration of 100 Bq/m³ has a lung cancer risk which is 16 % higher than that of a person living in a dwelling with a fictitious radon concentration of 0 Bq/m³. In case of higher radon concentrations of 200 Bq/m³ or 300 Bq/m³ the risk increases correspondingly to 32 % or 48 %, respectively.

The European study arrives at the conclusion that in Europe about 9 % of all lung cancer deaths can be caused by radon in dwellings. Smokers are exposed to an absolute higher risk due to radon than life-long non-smokers. For example, the risk of dying from lung cancer up to the age of 75 increases in the group of smokers from 101 to 216 per 1000 persons at 0 Bq/m³ compared to 800 Bq/m³, in the group of life-long non-smokers, however, only from 4 to 9 per 1000 persons. The majority of the radon-induced cases of lung cancer are therefore smokers.

Michaela Kreuzer
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Does the public's perception of mobile telecommunications change? Results of the nation-wide representative survey in 2004

Within the scope of the German Mobile Telecommunications Research Programme (DMF), the infas – Institut für angewandte Sozialwissenschaft – has annually carried out nation-wide representative surveys of the perception of mobile telecommunications. This has been done on behalf of the Federal Office for Radiation Protection since 2003 and will be continued until 2006. The phone interviews with 2500 persons aged 14 years and above should gather the current perception of the public with respect to health risks to electromagnetic fields and possible changes over the period under investigation. This contributes to improving the BfS risk communication associated with possible

health effects of mobile telecommunications.

Comparison of the survey results of 2004 with those of 2003 shows over all areas of no or only insignificant changes. An exception is the use of mobile phones in the public which has increased significantly since 2003 and comprises now 78 % of the registered public (in 2003: 73 %). In particular the age groups over 65 show the comparatively largest increase from 39 % of mobile phone use in the last year to 51 % in this year. Nearly unchanged compared to 2003, 27 % of the interviewed persons use their mobile phone daily or nearly daily, on average 28.4 minutes per day. The reason for not using the mobile phone is still not so much a rejection of this means of communication but only the lacking need for it.

The shares of the public describing themselves as being concerned (30 %) or health-wise affected (9 %) with regard to high-frequency electromagnetic fields have only changed inconsiderably compared to 2003 (31 % or 8 %, respectively). The health effects due to electromagnetic fields that were mentioned in most cases are headaches and sleeping problems. The comparison of the perception of health risks due to mobile telecommunications relevant radiation sources with other possible health risk factors shows that the level of concern regarding mobile telecommunications transmitters and mobile phones is clearly below the level of concern regarding air pollution, the side-effects of medicine, the consumption of meat of unknown origin, heavy cigarette-smoking and participation in traffic. If there is concern or an impairment due to electromagnetic fields, depending on their extent, mobile telecommunications transmitters or mobile phones are not uniformly mentioned as trigger.

The state of information of the questioned persons with regard to electromagnetic fields and their attitude towards the topic has not changed since the last survey. The SAR value is known to 28 % of the interviewed persons and does not represent a considerable increase in knowledge nor in the relevance with respect to the buying behaviour. The differentiated consideration of knowledge and application of precautionary measures in the population which has been performed for the first time in these surveys shows that precaution with regard to the protection from electromagnetic fields is currently no relevant topic for 80 % of the interviewed persons. Such measures are neither

taken into consideration nor are they carried out. The level of publicity of recommendations on the use of mobile phones varies much in the general public. Most known are the recommendations to do without the mobile phone and to use instead the fixed network and the recommendation to use a hands-free speaking system / head set and outdoor aerial in the car.

The report of the survey can be downloaded in the Internet under http://www.emf-forschungsprogramm.de/forschung/risikokommunikation/risikokommunikation-verg/risiko_021_Bericht_2004_voll.pdf.

Christiane Pözl

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Abridged report on the BfS expert discussion "Multilayer computer tomography as early diagnosis measure"

Current health strategies aim increasingly at early diagnosis measures. While so far interest has concentrated on conventional radiographs such as the X-ray mammography within the scope of the early diagnosis of breast cancer, the trend becomes apparent to use also dose-intensive methods such as X-ray computer tomography (CT) for the purpose of early diagnosis. As early diagnosis measures by means of multilayer computer tomography (MS-CT) the following examinations are currently especially discussed:

- Lung CT for the early diagnosis of lung cancer (e. g. in smokers and workers handling asbestos)
- CT coronary calcium deposit quantification (coronary calcium deposit is considered an acknowledged marker for arteriosclerosis) as well as CT coronary calcium deposit angiography for the early diagnosis of contracted coronary vessels
- Abdomen CT as "virtual coloscopy" for the early diagnosis of intestinal adenoids and cancer of the colon

At present a substantiated benefit-risk evaluation related to the aforementioned early diagnosis measures is not possible. The discussed approaches on the justification of the application of CT examinations range from

an "individual early diagnosis measure" on the basis of an individually made justifying indication (§ 23 X-ray Ordinance) to structured screening programmes, i. e. "voluntary serial X-ray examinations for the early diagnosis of diseases in specially affected groups of persons" (§ 25 X-ray Ordinance). Beyond this legally regulated area there is a phenomenon which is already particularly widespread in the United States but which can be increasingly observed in Germany as well: the so-called "grey screening". Through advertising measures, e. g. in the Internet, the CT is praised as "health check-up". In order to avoid a violation of the X-ray Ordinance, one tries to account for a justifying indication by identifying widespread risk factors – e. g. a higher age, enhanced blood-fat values, high blood pressure, etc..

As a basis for an objective and substantiated evaluation of the MS-CT as an early diagnosis measure BfS carried out an expert discussion on this topic on 23rd February 2005. The following topics were discussed:

- Technical status and development potential of the MS-CT
- Epidemiological bases related to lung cancer, cancer of the colon and coronary heart disease as well as screening problems
- Tumour screening by means of MS-CT in the area of lung and colon
- Heart screening by means of MS-CT

Representatives of the Deutsche Röntgengesellschaft (DRG), Deutsche Gesellschaft für Pneumologie (DGP), Deutsche Gesellschaft für Verdauungs- und Stoffwechselkrankheiten (DGVS) or the Deutsche Gesellschaft für Kardiologie – Herz- und Kreislaufforschung (DGK) submitted statements on the topic MS-CT as early diagnosis measure for the respective areas ("lung", "colon", "heart"). There was agreement that currently no structured screening programme is indicated for either of the mentioned MS-CT examinations. The competent expert societies, however, consider it necessary to elaborate catalogues of criteria for giving an indication for an individual MS-CT early diagnosis measure. The objective of these efforts is in particular to avoid or at least clearly reduce "grey MS-CT screening".

Elke Nekolla

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2003 Radiation Protection Research Programme Report

The *Radiation Protection Research Programme Report* regularly informs the public about (interim) results of research projects in the field of radiation protection of the BMU departmental research programme. The results of these projects serve as decision-making aids in the elaboration of radiation protection provisions and in the fulfilling of the complex expert tasks of BMU and BfS in the field of radiation protection.

Research in this field serves the best possible precaution and thus the protection of the population according to the state-of-the-art of science and technology.

This programme takes up current questions and contributes with research work to the acquisition and upgrading of scientific knowledge and to practical, usually interdisciplinary methods of resolution. The new programme report, which can be ordered at the *Wirtschaftsverlag NW, Verlag für neue Wissenschaft GmbH, Postfach 10 11 10, in 27511 Bremerhaven*, refers to the results of the projects concluded in 2003 as well as on the status of the still running projects. The research topics of the projects concentrate on the following areas of radiation protection:

- Natural radiation exposure
- Radiation biology – effect of ionising radiation, radiation sensitivity
- Medical radiation exposure
- Radio-ecology
- Emergency management
- Radiation protection technology
- Projects with general importance to radiation protection
- Projects in the field of non-ionising radiation
- German Mobile Telecommunications Research Programme

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Measures to avert a danger in the central part of the ERAM – an interim report

Since October 2003, BfS as operator of the former Morsleben repository for radioactive waste (ERAM) has backfilled selected mine openings in the central part of the ERAM with salt concrete consisting of salt, coal filter ash, concrete and water, in order to stabilise the rock-mechanic state of the central part of the ERAM.

The concept of the supporting measures consists in reducing the cavity volume by a supporting backfill (complete backfilling of selected mine openings) and to further ensure the stability of the remaining cavity system. The cavity volume of these mine openings is about 670,000 m³. The supporting backfill in these cavities reinforces the pillars so that the loads resulting from the rock pressure can be worn better and the integrity of the salt barrier against the overburden remains permanently.

This mining measure to avert a danger is carried out pursuant to Mining Law according to a demand of the Federal State Office for Geology and Mining of the Federal State of Saxony-Anhalt as competent mining authority.

The backfilling measures were at first started with a mobile salt concrete conveyor with a daily capacity of up to 300 m³. In May 2004 the stationary salt concrete conveyor was taken into operation. The mean backfill capacity is currently about 400 m³/d and is supposed to be increased to a backfill capacity per workday of 580 m³. The following mine openings have been backfilled with salt concrete up to now:

- Mine opening 1an, 3a-level
26,165 m³
(08.10.03 to 25.03.04)
- Mine opening 13n, 3a-level
17,441 m³
(31.03.04 to 06.08.04)
- Mine opening 13s, 3a-level
49,578 m³
(09.08.04 to 08.02.05)

Currently the mine opening 13s on the 2nd level is being backfilled. The amount of backfill placed there up to now is about 12,000 m³. The mixing water is not completely bound by the salt concrete in the setting process but partially flows as spill-over solution off the mine opening to be backfilled. The spill-over solution is collected and reused above ground for the production of the salt concrete.

Currently one tries to refine the salt concrete mixture to minimise the giving-off of spill-over solution. The use of a new building material is checked as well.

According to current planning the backfilling measures within the scope of the mining measures to avert a danger in the central part of the Bartensleben mine should be concluded after the backfilling of altogether 21 mine openings in 2009.

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