

**Childhood Leukaemia in the proximity of the nuclear facilities of Geesthacht.
Findings of the Expert Commission of the German Federal State Schleswig-Holstein in
the Period 1993-2004 on the Causes of the Increased Incidence**

Final Report of the Chairman Prof. em. Dr. Otmar Wassermann

September 15, 2004

The Scientific Expert Commission to identify possible causes of the increased leukaemia incidence in the region of Geesthacht/Elbmarsch at the Ministry of Nature, Environment, and Regional Development was appointed by the Government of Schleswig-Holstein in 1992, when an extraordinary increase of childhood leukaemia had been occurred in the community of Elbmarsch. Apart from the chairman it consists of seven full members. Five of these are coauthors of this report (see below).

The members of the Commission worked voluntarily.

The community of Elbmarsch is located at the Lower Saxony bank of the river Elbe opposite to the nuclear facilities of Geesthacht (nuclear research center GKSS¹ and nuclear power plant Krümmel, KKK), about 25 km east of Hamburg. The Commission had to investigate the question whether the diseases could have been engendered by radioactive emissions. Other possible causes of leukaemia were investigated by the Lower Saxony Leukaemia Commission and have been excluded.

In 2002, the “North German Study on Leukaemia and Malignant Lymphoma” carried out by the Bremen Institute of Prevention Research, Public Health and Epidemiology could not find an association between the operation of the nuclear power plant and the occurrence of leukaemia in adults. For this study normal operation conditions with continual emissions below the permitted limits were assumed. The Commission, however, rather investigated illegal releases of radioactivity.

On the basis of chromosomal aberrations in the local population (biological dosimetry) and elevated radioactivity (beta and gamma emitters) in the environs, which did not correspond with the official reports about the radioactive emissions of the facilities, the Commission stated in 1997, that these facts harden the suspicion of a causation of leukaemias by radiation exposure. The extent of the leukaemia cluster, however, apparently could be explained only by high LET irradiation, e.g. from incorporated alpha-emitters, which are not specifically controlled in the mandatory environmental monitoring. The sudden occurrence of the diseases was only compatible with an accidental release of radioactivity and the incessant duration of the effect with a long half-life of the emitted nuclides. Therefore, the interest was focussed on an event in September 1986, where an aerial radioactive contamination above the grounds of the nuclear power plant KKK had occurred.

Due to the investigations of several scientific teams in the last years we come to the following conclusions:

1. In the environs of KKK and the adjoining GKSS exists an elevated radioactive contamination of the ground, the distance gradient points to the sources KKK and GKSS.
2. In attics of houses in the community of Elbmarsch plutonium isotopes and americium were detected. Their composition excludes that they are part of the background caused by the fallout of the former atomic bomb tests. On the other hand, these transuranium nuclides have not been generated by the normal operation of KKK.

¹ Gesellschaft für Kernenergieverwertung in Schiffbau und Schifffahrt GmbH.

3. Transuranium and other nuclear fuels (enriched uranium and thorium derivatives) can also be proved in soils of the KKK and GKSS environment. They are related by scientists of ARGE PhAM², Weinheim, to detected microspheres which they connect with special nuclear experiments. According to ARGE PhAM, both type and composition of the microspheres point to their origin from an hybrid system which combines the techniques of nuclear fusion and fission, ought to be used for energy production.
4. Mass spectrometry of microspheres revealed proportions of plutonium, uranium, and thorium, thus confirming the hypothesis of ARGE PhAM.
5. In September 1986, radioactive fission products were released. It is unknown whether the observed nuclear fuels and transuranium elements were deposited at the same time also in the environment.
6. A recorded fire event in September 1986 on the grounds between GKSS and KKK confirms the accidental scenario.
7. Tritium in tree rings of 1986 which already had been detected earlier confirms the hybrid assumption (fusion by use of tritium) and provides a temporal connection to the accident.

In contrast to assumptions of the December 1997 statement, the majority of the Commission now comes to the conclusion that – although the emissions from KKK should still be considered as a partial cause of the leukaemia diseases because of a variety of unexplained events and because of the specific local climate – the essential contamination for leukaemia induction might have been caused by secret special nuclear experiments on the GKSS site.

From the readings of the official environmental monitoring for September 1986 and of the dosimeters on the roof of the KKK turbine building, aerial contaminations are reconstructable which amounted to thousand times the Chernobyl-generated radioactivity in that region.

The contributions to the inhalation dose by transuranium nuclides derived from the measurements in attic dust are suitable to explain the leukaemia effect, because young children and embryos are particularly sensitive, and – via the maternal circulation during prenatal exposure – these nuclides produce very strong effects on the developing haemopoietic system.

We regret the long time to achieve the present state of knowledge, but we charge for that the tremendous resistance by federal and regional authorities which opposed our efforts. In particular, our investigations were hindered by the fact that the supervising authority for nuclear facilities (until recently the “Section for Nuclear Safety” of the Ministry of Finance and Energy, SNS-MFE, of Schleswig-Holstein) was – although not nominally but in reality – the official contact of the Commission. These responsible have denied any irregularity of the nuclear facilities and therefore any gap in their own supervision, they have constructed counterclaims to all above-mentioned results. The selective consideration of reports, however, culminated in a special task of the long-standing head of the SNS-MFE, Dr. W. Wolter, during whose office period the construction of KKK was carried out as well as the years of operation followed with the increase of leukaemia cases. After transfer to an early retirement he emerged as an employee of unknown “expert firm” SAST and produced reports for his former ministry as allegedly “independent expert” to disprove findings of the Commission. Therefore, Dr. Wolter evaluated his previous own official work³.

In addition, the unanimous willingness of nearly all other authorities and laboratories of the state opposed our work by tolerating or supporting the positions of the ministry without dis-

² Arbeitsgemeinschaft Physikalische Analytik und Messtechnik, Prof. Dr. R. Brandt, Dipl.-Ing. H. W. Gabriel (Manager), Dr. D. Schalch, Prof. Dr. Dr. h. c. A. Scharmann

³ see Appendix References

curring our arguments in a scientifically adequate way. Acceptance of our elaborated results and support of many further, relevant efforts of elucidation were given to the Commission only by NGO's, like IPPNW⁴, Citizen's Initiative⁵, BUND⁶, CDAK⁷ und GSS⁸ as well as by individuals. Typically enough, the Citizen's Initiative and IPPNW have also provided the funds necessary to finance the essential measurements of the last years.

The radiation hypothesis is not only supported by the proven cell mutations in inhabitants of Elbmarsch and the observed radioactive contaminations, which are not congruent with the official reports, but also by the medical-biological characteristics of the childhood leukaemia cluster. Typical for radiation as origin are the age and sex distribution.

The striking shift of the diseases to very young ages compared to the normal incidence corresponds to the high radiation sensitivity in early childhood. Thus, it would be no contradiction if future epidemiological investigations, which refer correctly to the time course of the leukaemia phenomenon, would come to the conclusion that there is no association derivable between the nuclear facilities of Geesthacht and the incidence of leukaemia in the *adult* population.

The fact that boys are predominantly affected corresponds to the results in the survivors of the atomic bombing of Hiroshima and Nagasaki.

As shown by the German Childhood Cancer Registry, there is no increase of other childhood malignancies near Geesthacht up to now. This speaks well for the selective effect to the bone marrow of the alpha emitting nuclides in contrast to an homogenous whole body irradiation.

According to the German Childhood Cancer Registry, within the 5 km-radius of the nuclear power plant Krümmel the rate of leukaemia cases in children has yet remained significantly elevated (about 3-fold), and is called "frightening". After 1995 all of the affected children were younger than 5 years. This fact demands to continue the investigations and to eliminate the cause(s) immediately.

In order to finally clear up the cause(s) of the observed environmental contaminations and the exposure pathways responsible for the incessant effect the following additional investigations are considered to be relevant:

1. The extent of contamination by enriched uranium, thorium, plutonium and americium isotopes ought to be estimated by nuclide specific measurements in soil both in different depths and distances from the assumed location of emission, actually in a close-meshed systematic way. The question whether they were released at the same time with the fission products in September 1986 could be solved by corresponding correlation studies.
2. All the children diseased since 1995 were born after 1986. The question whether a relevant continuous incorporation of the nuclides in question still exists in the parents could be answered by further biological dosimetry.
3. The data of the "North German Study on Leukaemia and Malignant Lymphoma" mentioned above should be used to focus both on a temporal coincidence of an elevation of the leukaemia rate in the population and on the assumed beginning of the exposure in 1986.

⁴ International Physicians for the Prevention of Nuclear War, German Section

⁵ Citizen's Initiative against Leukaemia in Elbmarsch

⁶ BUND German Section Friends of the Earth

⁷ Christian Democrats against Nuclear Power – Federal Organisation

⁸ German Society for Radiation Protection

We suppose that both the recommended additional determinations of environmental radioactivity and the application of the results of the Radiobiological Evaluatory Report⁹ could establish dose-effect-relationships, which can explain the observed high incidence of leukaemia. This should trigger immediate successful preventive steps against further radioactive exposures of the population on risk.

After our most disappointing experiences during the last 13 years in this Commission, however, we cannot recognize that the Government of the Federal State of Schleswig-Holstein – in sharp contrast to its own initial order of “Uncovering the causes of the increased incidence of leukaemia around the nuclear facilities KKK and GKSS” – is actually interested in uncovering the truth. This is also substantiated by the omission of support by the district attorney and by the regional criminal office, which was demanded by us in order to shed light upon the blaze in September 1986 on the GKSS grounds.

We have lost our confidence in this Government of the Federal State of Schleswig-Holstein.

We therefore resign from this Commission immediately. We regret this step only with respect to the people being threatened by the nuclear facilities at the river Elbe (and elsewhere), but being abandoned by the government.

Personally, we further will try to solve the open questions in cooperation with IPPNW, Citizen’s Initiative, GSS, and others as well as ARGE PhAM. The Elbmarsch Report which was the base of our last public session on October 14, 2002, in Marschacht (see references in the Appendix) and which is reviewed at present shall be completed and published in the near future.

Prof. Dr. rer. nat. Otmar Wassermann (Chairman of the Commission)

and the following Members of the Commission

Dr. med. Helga Dieckmann, MPH

Prof. Dr. rer. nat. Inge Schmitz-Feuerhake

Prof. Dr. med. Horst Kuni

Prof. Dr. med. Roland Scholz

Prof. Dr. med. Dr. h.c. Edmund Lengfelder

⁹ Stevenson, A.F.G., Institute of Toxicology, Christian-Albrechts-University of Kiel: “Radiobiological Evaluatory Report to Appraise the Status and Reliability of Regulations on Radioprotection in Keeping Pace with Progress in Knowledge, with Special Reference to the Radioactive Burden in the Vicinity of Nuclear Power Plants, and the Question on Radiation Induction of Childhood Leukaemia (with Appended International Contributions from Experts)”. Prepared on Contract for the Ministry of Finance and Energy of the Federal State of Schleswig-Holstein, Germany. Kiel, April 2001

APPENDIX

Comments, Basic Reports and Investigations

Accident in September 1986 and Environmental Contamination by Nuclear Fuels

The Commission leans on the Elbmarsch Report of 2002, which was presented on the occasion of its public session on October 14, 2002, in Marschacht/Elbmarsch (IP04). In this report the results of the expert group ARGE PhAM (AR00-AR02b) as well as the investigations of the Scientific Secretary of our Commission, Dr. habil. A.F.G. Stevenson, on microspheres (Ga01) are related to the former findings. The plutonium and americium results in attic dust of Elbmarsch houses were published inter alia in an international scientific journal (Sc00, Sc98b, Sc03a).

Because the supervising ministry insists on having disproved all presented circumstantial evidence, the Elbmarsch report contains also an analysis of the statements of the supervising ministry. The latter, however, were not convincing. Members of the Commission, ARGE PhAM, and other scientists have written replies which were mostly published also elsewhere (Di00, Pf00, Sc98a, Sc01a, Sc01b). There are also published answers to the claim of the Lower Saxony Department of Ecology and the Institute of Transuranium Elements (ITU) in Karlsruhe that enriched uranium could not be detected in the region of Elbmarsch (Di01, Br02). The internationally known ITU even had the effrontery to give a detection limit of about 100 000 Bq (!) per kg for the (most frequent) uranium-238 and therefore a 10. 000-fold inferior measuring sensitivity of their equipment than usual in other laboratories (Br02).

According to recent information, the Government of Schleswig-Holstein (SNS-MFE) is supposed to have ordered a further “expert’s report” by Dr. Wolter in which he allegedly “disproves all accusations”. This ordered work is unknown to us. We have been informed, however, that Dr. Wolter claims that the conclusions from the Crakow analyses of attic dust (Sc03a) are unscientific because the higher concentrations of plutonium in the Elbmarsch samples were gained by selection of the locations of the highest deposition. He reproaches therefore Schmitz-Feuerhake even for “fraud”. Such an argumentation is absurd. How can it be unscientific to make special investigation at very suspicious locations if hidden plutonium and other transuranium elements are to be searched for? Our conclusions are not at all based on the comparison of mean concentrations in Elbmarsch and control regions. Rather it is shown by the nuclide composition of the plutonium and the daughter of plutonium-241, americium-241, i.e. the relation of their respective concentration, that these depositions cannot be a matter of “normal” background. The composition of the latter is well known from the literature. This deduction is again confirmed also in the journal Health Physics (Sc04). It is proved therefore in the study that at least the transuranium americium-241 came to the Elbmarsch by another source than the former atomic bomb tests or the Chernobyl accident.

The investigation of attic dust which was undertaken by SNS-MFE – although without investigating the suspicious americium more precisely – shows the significant deviation from the background composition already in the plutonium isotopes among themselves. Several samples showed much higher concentrations of the relatively short-lived isotope plutonium-241 (half-life 14.4 y) compared to plutonium-239 and -240 than would be expected normally. This is also true for samples which allegedly come from control regions. Dr. Wolter claims the excess of plutonium-241 would have been generated by Chernobyl. This is, however, impossible as we know from measurements after Chernobyl in Germany (Pf00, Sc01a, IP02).

For plutonium determination by mass spectroscopy, SNS-MFE sent the samples to the Institute of Nuclear Chemistry at the University of Mainz. One explanation of the too high proportion of the isotope plutonium-241 in the control samples might be that the Elbmarsch material

was divided before transporting to the institute and served also as control material. Because the very precise measurements in several of the Elbmarsch and control samples showed exactly the same relation of the concentrations of the 3 plutonium isotopes (“fingerprint”) and also the same absolute concentrations (Di00). This is, however, not conceivable in a material as attic dust from different regions and from differently old roofs, especially not if the radioactive composition according to Wolter shall result from different sources. Mistake or fraud? The same question came up after the proof that the used “random figures” for coding the blood samples in the chromosome study were not randomly distributed at all, but allowed an assignment to the investigated groups in most cases.

Dr. Wolter claims the attic dust investigation of Kiel would prove the missing of a contamination in the environs of the Geesthacht nuclear facilities because of the “non-distinguishable concentrations in Elbmarsch houses and controls”. He cites it as one of the “disprovings” of our theses. But that could be at most a situation “word against word”.

In reality, the SNS-MFE investigation confirms that unexplainable plutonium contaminations have occurred.

Further Environmental Contaminations

In the Elbmarsch Report (IP02), the findings in connection with the September 1986 event and the contamination by nuclear fuels are presented. The former findings about fission products and radioactive corrosion products, which have appeared more or less chronically since the start-up of KKK in 1984 in soils, plants, air, and rain water as well as in water from wells, are presented both in reports to the Commissions and in publications (Sc96, Sc97, Sc98a, Da01).

Furthermore, they are discussed in the Radiobiological Evaluatory Report (see below), actually in the contributions of Schmitz-Feuerhake (Sc01c-e).

The Impossibility to Clear Up the Fire Event in September 1986

A monitoring system for the nuclear power plants in Schleswig-Holstein (KFÜ) independent of the operators is installed for the supervising ministry in Kiel. In different distances around the nuclear power plants several radiation detectors are installed to continuously control the prevailing level of exposure by the gamma dose rate. The data are sent to a central laboratory in Kiel and managed by a charged firm (ESN).

The weekday of the “radon event” on September 12, was Friday in the 37th week of the year 1986. However, the recordings of station 3/09 of the KFÜ (localisation:”GKSS Tesperhude/Institute of Physics) show a gap from the 37th week until the 50th week. The report of the firm ESN showing extracts from the registration notices for that:

“Station 3/09 38th-49th calendar week unplanned station transfer after fire at the original location of installation”

We know by own appearance that there are fire traces on an area between GKSS and KKK (charred relics of trees etc.) – which was fenced in in the meantime. An aerial photo before 1986 shows there a building. In 2001, we enquired for details about the fire in September 1986 of the district fire office. The head of the office told at the telephone that all documents from the period have been destroyed by a fire in the office of the fire protection station. This fire allegedly had occurred on September 1, 1991. Were documents of the fire office about the nuclear accident in September 1986 destroyed by arson?

Further information was not accessible for us.

Biological-medical Parameters

The proof of an radioactive exposure by biological dosimetry in 21 adults of the community of Elbmarsch (financed by the Citizen's Initiative and carried out by a team of the Bremen University) was a basic contribution to the elucidation of causes for the high incidence of leukaemia. The results were published inter alia in international scientific journals (Sc94, Sc97, He98, Da01).

The rate of dicentric chromosomes in the lymphocytes was elevated 10-fold in single cases and significantly 4-fold in the mean compared to unexposed persons. Immediately after a single homogenous whole body exposure a mean dose of about 40 mSv would be derivable by that. Because of the temporal instability of the effect and the presumed inhomogenous distribution of the nuclides in the body a dose estimation, however, is not possible. The investigation, however, provided a further important information: a significantly inhomogenous distribution of the dicentric chromosomes in the cells was shown (overdispersion, i.e. deviation from Poisson distribution). This is a certain indicator of an effect of a high LET radiation, in this case of an important contribution by incorporated alpha emitters. Especially because of this reason the interest was focussed to search for such nuclides in the environment.

Against early results in 5 sibling children of leukaemia cases by Schmitz-Feuerhake in 1992, which had been made public and correctly called preliminary, the nuclear lobby vituperated in big propaganda campaigns. Later it could be demonstrated that these children had also shown a significant elevation of dicentric chromosomes in the blood (Da96).

In further chromosome studies which were financed by the Federal States of Schleswig-Holstein and Lower Saxony several laboratories were charged with the analysis of the samples. The laboratories neither had influence on the selection of persons, nor did they participate in the blood drawing. The first investigation included 102 children – against the recommendation of the Commission (since children did not appear suitable because of the then unknown control values and an supposedly particular short half-life of the dicentric chromosomes). The study showed no significant difference between Elbmarsch children and controls. The control value of $0,71 \times 10^{-3}$, however, was inexplicably high. All dicentric chromosomes were found in girls, two of them showed even 4 and 3 dicentric chromosomes in 1000 and 642 cells, respectively. Never before such a high rate had been found in a non-exposed person by any of the concerned laboratories.

On the other hand no single dicentric chromosome was shown in 11 boys of the control group in 9218 cells.

Because of these discrepancies the investigation was repeated. As a result it was shown that one of the charged laboratories (from Robert Koch Institute of the Federal Health Administration in Berlin) was not able to detect blood samples which – for quality control – had been irradiated with a defined dose. In contrast, the Bremen laboratory passed the quality control. The origin of the doubtfully high control values in the children study could although not be elucidated. The Commission declared the results of the study unusable due to severe methodical deficits. Nevertheless this “study” was published (Br01), not mentioning the grave differences between the results of the different laboratories, nor the inexplicable gender differences, nor the high single values in the controls (Sc03b).

A cooperative study carried out in the same manner in adult volunteers also lead to inexplicably high control values and great differences between the results of the different investigators. The Bremen laboratory found in the material of the blind study the same rate of dicentric chromosomes in Elbmarsch persons as in the above mentioned study under own responsibility. The Commission considers the second combined study also to be unusable. By correct

planning, however, sources of friction easily could be excluded. Therefore, a repetition of the study to evaluate the temporal course of the exposure definitely would be recommendable.

From the beginning of the large-scale use of nuclear fission until now an increased incidence of leukaemia was repeatedly observed internationally around such facilities. The official argument to deny a connection of the diseases with the radioactive emissions in general – as well as for Geesthacht – is by stating that “the possible dose can not be sufficient to explain the extent of the effect”.

It was the aim of the “Radiobiological Evaluatory Report” (St01) – which was ordered by the Government of Schleswig-Holstein due to a coalition agreement between the Social Democratic Party (SPD) and the Greens (Bündnis 90/Die Grünen) – to examine the reliability of such predictions on the dose-effect-dependency. Among the experts involved in this report were also members of the Commission. The overall charge was given to the late Scientific Secretary of the Commission, Dr. rer. nat. habil. A. Frederick G. Stevenson¹⁰.

The usual risk estimates do not consider that 3 or 4 types, resp., of exposure contribute to the radiation induction of childhood leukaemias: 1) the somatic effect of the exposure (the irradiation of the child in a post-natal phase), which is in general considered exclusively; 2) the exposure in utero, which causes the disease of the child later on born; 3) the preconceptional exposure of father or mother, which leads to genetic variations and, therefore, induction of leukaemia in the later conceived descendant. In case of radioactive exposure of a population these effects will occur cumulatively. It is shown in the Radiobiological Evaluatory Report that the doubling doses for these effects are considered to be very low.

The discovery of alpha emitting actinides being involved – via the inhalation pathway – in the residents near Geesthacht, is of essential importance for the detection of causes of the high incidence of leukaemia. According to the official view, the alpha emitting plutonium and americium isotopes already generate a 100 to 1000 times higher bone marrow dose per inhaled Bq compared to prominent beta emitting fission products (Bu89). It is shown in the Radiobiological Evaluatory Report that the dose factors for incorporated radionuclides (which are given without confidence limits) are considerably uncertain. Thus, it can not be excluded that their use might underestimate the effective dose by several orders of magnitude. Especially, the investigations of Lord and coworkers, Manchester, are presented in the Radiobiological Evaluatory Report, which were undertaken because of the high incidence of childhood leukaemia near the British nuclear reprocessing plant Sellafield. Applied during gravidity in rats, they detected enormous effects by plutonium on the fetal haemopoietic system.

The Radiobiological Evaluatory Report, which did not only provide comprehensive material about critics of usual dose-effect-estimations but also about the lacking reliability of official calculation procedures for population exposure, was also – typically enough – taken and presented to the public by the SNS-MFE without considering the relevant critical results. The reports by Schmitz-Feuerhake about the environmental contaminations near Geesthacht and the methods to calculate the population exposure were omitted by the MFE in the version published by them “because of lacking reliability of the author”. However, they are available through <http://www.oh-strahlen.org/docs/index.html#strbgab1>.

We condemn this behaviour of SNS-MFE in the strongest possible terms.

¹⁰ The exertion of influence by the responsables of the Section of Nuclear Safety, SNS-MFE, on this critical, world-wide exceptional documentation and the following tough debates about politically unwanted contents badly affected the health of this highly qualified scientist of integrity – he died on June 2, 2004, on sudden cardiac arrest.

The refutation of the claim that the observed type of childhood leukaemia would not be inducible by ionising radiation had to be accepted as well as the deduction of a very low doubling dose for children in the first years of life of about 20 mSv (Ku02).

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