

COMMENTARY

Chernobyl – Looking back to go forwards: the September 2005 IAEA Conference

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Introduction

In the history of the natural sciences, and of medicine in particular, controversial discussions are nothing special. Typically, the dominant teaching is conservative. Incumbent professors and officials rarely react enthusiastically to new findings of a colleague which might suggest any revision of their own textbooks. This mental inertia, though understandable, is especially apparent where recognition of new findings will entail the admission of incorrect and damaging actions of one's own. I am reminded of the difficulties which Ignaz Semmelweis was confronted with by his colleagues when he realised that the fatal puerperal fever could be simply and effectively avoided if physicians washed their hands thoroughly after an autopsy before examining women giving birth. Alice Stewart proved that x-rays to measure the pelvis of pregnant women led to an increased leukaemia rate among the children of those women. More than ten years went by before medical colleagues finally stopped taking such x-rays, but she was still treated as a pariah by her own profession. New findings are delicate in another way when they affect ideological or religious beliefs, as in the case of Galileo.

A critical appraisal of the use of nuclear energy (peaceful as well as military) shows both reasons for bending scientific opinions. Moreover, even scientists whom one assumes to be level-headed and clear-thinking are keen to climb the career ladder quickly. Far too often they prefer serving Mammon and gratifying their desire to belong to the club of specialists recognised by authority to establishing and advocating the truth. 'Professor', however, has nothing to do with the Latin word *proficere* (to advance, to win, to progress) but stems from the Latin *profiteri*, which means publicly confess. Science is not about confessing just anything, but

about confessing the truth. Banal as that may sound, it is neither self-evident nor general practice. Increasingly scientific research is being throttled financially, as it becomes more and more dependent on lucrative grants from industry or governments. As a result, truth, or the desire to protect others from the harmful side effects of economic activities, or the natural partisanship of citizens harmed by dangerous substances, by catastrophic technologies and ruthless working conditions, have become luxury goods for scientists. Their pursuit may mean a disadvantage or even a quick end to your career. Still, a critical view of the wizards in white coats – their inertia, their past errors, their opportunistic inclination to find what the client would like to be found and to suppress what could jeopardise the next grant, their attempts to ingratiate themselves to the powerful and their lack of solidarity with the common people, the ‘victims’ – is as essential to the search for the truth as a deep understanding of measurements, of facts and of logic.

It is small consolation that truth will usually win in the long run, because we are confronted with problems here and now. It is small comfort to realise that truth is not discovered by majority decision of any scientific committee. Such expert bodies wrongly give the impression that they can define truth exactly, and they even believe they should do this. The more their truth meets the expectations of government and politics, the stronger their influence on both.

These observations clash with the respect for authorities, for scientists and particularly for physicians, instilled in our culture over generations. If we do not dare to constantly check the justification for this respect and to question it, we will hardly achieve a reasonable and well-founded position of our own towards other issues, notably the conflicting and irreconcilable statements about the Chernobyl disaster.

In retrospect

In autumn 1986, the USSR submitted its report on the Chernobyl disaster in the context of a large conference of the International Atomic Energy Agency (IAEA) in Vienna [1]. Since at this time the strict secrecy regulations of the KGB applied to almost all relevant questions in connection with Chernobyl, it is unclear, even today, whether the authors of that report ignored the orders of the KGB and reported to the best of their knowledge and belief, or whether they dished up fairytales to the international experts assembled there. The report was delivered by USSR Academy member and deputy director of the Moscow Kurchatov Institute, Professor VA Legassov. His suicide in 1988 and the moving passage in his will about the Chernobyl problems rather point to the fairytale version. Data from Appendix 7 of the 1986 report are shown in Table I.

Table I. Radiation doses after the reactor disaster at Chernobyl.

Area	Inhabitants (million)	Collective dose over 50 years (million man rem) (10,000 man Sv)	Remarks
30 km zone	0.135	1.6	Evacuated persons
Ukraine SSR	50.8		External gamma-radiation by fallout
Belarus SSR	9.9		
Mold SSR	4.1		
Bryansk region	1.5		
Kaliningrad region	0.8		
Smolensk region	4.0		
Orjol, Kursk, Lipetsk	3.4		
	74.5	29	
Ukraine and Belarussian Poles'ye		210	Consumption of caesium-137 contaminated food over 70 years
Total		240.6	

Source: Ref 1: annexe 7.

In 1986, Recommendation No 26 of the International Commission on Radiation Protection of 1977 still applied, which states how many additional cancer and leukaemia victims were expected at that time for every one million persons contaminated with one rem (1 rem = 0.01 sievert). For this case, the ICRP indicated a risk factor of 125. Thus a total of $240.6 \times 125 = 30,075$ additional cancer and leukaemia deaths would have been expected, according to standard practice. This is only a rough calculation – nevertheless Rosen in the 1986 International Atomic Energy Agency bulletin speaks of approximately the same numbers. At that time, the United Nations Scientific Committee on the Effects of Atomic Radiation expected an additional 18,800 genetic diseases per generation. Non-fatal cancer illnesses were not yet taken into account, nor was the whole range of so-called non-cancer illnesses. After pressure caused by new findings from Hiroshima and Nagasaki in the following years, the ICRP increased their risk factor to 500 per million man rem (that is, 500 per 10,000 person-sievert or 5%/Sv in recently adopted units) in their recommendation No 60 of 1990. A combination of the new risk factor with the Russian data of 1986 predicts $240.6 \times 500 = 120,300$ additional cancer and leukaemia deaths.

The new risk factor, like the old one, is the result of a compromise between the commercial interests of the atomic industry and the pressure

generated by the Radiation Effects Research Foundation analysis of the Hiroshima and Nagasaki data. In 2000, UNSCEAR calculated a risk factor of 11%/Sv – which, combined with the Russian data, would lead to 264,660 additional cancer deaths. This links the Russian data with those of the committees (ICRP, UNSCEAR), which claim to express the latest scientific standards.

It is clear that these numbers do not throw a very positive light on the use of nuclear energy. In order to save its image, the International Chernobyl Project was established, headed by the IAEA, which submitted its results in Vienna in spring 1991. 200 western and 500 Russian scientists came to the desired conclusions: they alleged that there was no health problem that could be directly attributed to the radiation dose, and that the children who were examined were ‘generally healthy’. It is hard to imagine a more cynical slap in the face for the people afflicted or for the physicians who, under wretched conditions, are confronted daily with the declining state of health of the population. The Academies of Sciences in Belarus and Ukraine protested sharply against this miserable piece of work. In an equally biased fashion UNSCEAR reported in 2000 that except for thyroid cancer among children (‘treatable, not fatal’) there was no scientific proof of a rise of cancer incidence (new illnesses per year), cancer mortality (cancer deaths per year), or of non-cancer illnesses which could be linked to radiation dose. The IAEA triumphantly reported this in a press statement.

Preparations for the twentieth anniversary of the disaster

Hardly noticed by the public, the Chernobyl Forum of the United Nations was founded in 2003 as a strong-man act. This body unites organisations with illustrious names: IAEA, World Health Organization, the Food and Agriculture Organization, UN Development Program, UN Environment Program, UN Office for the Coordination of Humanitarian Affairs, UNSCEAR, World Bank, the governments of Belarus, Russia and Ukraine. On 6 and 7 September 2005, the results of its working groups were presented at a conference organised by the IAEA in Vienna. The purpose of this complex co-operation over several years was to formulate official versions with regard to the twentieth anniversary of the disaster on the highest possible level, namely that of UN organisations and governments, to conclude all research projects about Chernobyl and to propagate the thesis that the main problem of the region was poverty, not the Chernobyl disaster. As Dr M Repacholi, director of the WHO Radiation Program, dryly notes: ‘The main message of the Chernobyl Forum is: no cause for alarm.’

Admission to the conference was for delegates of government agencies only. Personal admission cards with photographs were provided, the conference rooms were accessible only through a metal detector, and bags

were x-rayed. The drafts of three volumes of working material, amounting to about 600 pages, were handed out:

- Environmental Consequences of the Chernobyl Accident and Their Remediation: Twenty Years of Experience;
- Health Effects of the Chernobyl Accident and Special Health Care Programmes (prepared by WHO) and;
- The Socio-economic Consequences of the Chernobyl Disaster.

Among the participants were high-ranking specialists, including Professor Leonid A Ilyin of the Institute of Biophysics with the Ministry of Health in Moscow. Ilyin is an important man: over decades all (secret) reports about radiation incidents on Soviet Union territory ended up on his desk. He has been the Soviet Union (later Russian) representative on the UNSCEAR committee and with the ICRP for many years. The Belarus physicians do not like him, because it is his personal responsibility that physicians were forbidden to implement saturation iodine prophylaxis immediately after the Chernobyl disaster. He had obviously hoped to keep yet another disaster secret from the public, and the time to institute prophylaxis ran out. Thousands of children and adults developed thyroid cancer due to this wrong decision by Ilyin. Also present in Vienna was Professor Yu A Izrael from the Institute for World Climate and Ecology in Moscow, who was responsible for the fall-out measurements. As early as 1990 he was quoted in the German magazine *Atomwirtschaft* (Nuclear Economy): ‘No radiation-based illnesses could be determined among the population.’

A first glance at the WHO report on the effects of the disaster on health

The report [2] submitted is only a study of arbitrarily selected literature. The authors met four times to discuss the report, which shows serious deficiencies. For some aspects, it relies on ten-year-old studies. A re-check of the statements is nearly or downright impossible. Data about dosimetry and the populations affected have been collected unsystematically or not at all; instead only rough estimates can be used, to which no ranges of error can be indicated. Instead, average numbers are formulated over large groups and vast territories, without knowing the specific figures. Assumptions are made and mentioned only in subordinate clauses, if at all, but they affect the estimates substantially and are more than doubtful.

Even the existing data are not freely accessible to external scientists for a more detailed debate on the WHO report, so you either believe what the UN scientists presented – or you don’t. That has little to do with science. A well-founded scientific discussion process is impossible, as long as the source data are available only to one side.

The liquidators

Until 1996, the registers in Belarus, Ukraine and Russia listed 200,000 liquidators, whereas the present WHO report indicates that approximately 400,000 liquidators are registered. At the same time, it is conceded that altogether 600,000–800,000 liquidators were sent in. It seems reasonable to assume that approximately half of the liquidators – predominantly young soldiers – were decommissioned without being registered, and went home without knowing their radiation dose and for the most part without access to physicians who specialised in diagnosing radiation damage.

The data even of registered liquidators are very incomplete. There are no records of the work done by them from which certain inferences on the dose could be gained. For the Russian liquidators there are dose data in 63% of cases, for the Ukrainian liquidators in 56%, and for the Belarus liquidators in only 9%. Nevertheless, the WHO report gives mean values, median values and 75% and 95% percentiles for external radiation doses. But what is the value of such data?

The report does not mention decree No U-2617 C of 27 June 1986 by the III Head Office of the Ministry of Health about increased secrecy measures for liquidation work at the Chernobyl nuclear power plant (signed by Schulschenko):

Secrecy is imposed upon any data concerning the accident. Secrecy is imposed upon the results of treatments for sicknesses. Secrecy is imposed upon the data about the extent of radioactive contamination of personnel, who took part in the liquidation of the accident at the Chernobyl atomic power plant.

The WHO report does not evaluate yet another order by the same agency (Government order No 52617, order No 205 of 8 July 1987):

The acute and chronic illnesses of persons, who participated in the liquidation of the consequences of the accident at the Chernobyl atomic power plant and who were exposed to a dose of less than 50 rem [500 mSv] may not be connected with the effects of ionizing particles.

If these instructions were applied to the Hiroshima and Nagasaki data, it would be nearly futile to discover any radiation victims there. Now, even the most sophisticated reconstructions do not allow restoration of what was inaccurately recorded, or not recorded at all under pressure from the government and the KGB in the first years after the disaster. The longer these data are rehashed, the more obscure and improbable the result becomes.

The WHO report only takes into account 200,000 liquidators, who worked in the bad years of 1986 and 1987; the IAEA, as of August 2005, speaks of 350,000 liquidators on duty during those two years. If one considers these data, the number of expected additional cancer and leukaemia deaths among the liquidators only would rise by 1650.

Spot checks

Since the basic data are kept secret, independent calculations are possible only in exceptional cases. However, the WHO report can be checked against the indicated references. Reading for example a study quoted in the report, strange details emerge.

In their original work [3], E Cardis and colleagues (International Agency for Research on Cancer, Lyon) give estimates for the cancer and leukaemia deaths which can be expected over a period of 95 years among the liquidators, and those evacuated from the 30 km zone, as well as for people living in the zone of strict control, and those living in other contaminated areas. Among other details, the number of persons, the average dose received and the forecast number of additional cancer deaths are provided. In the original work, uncertainty ranges are given, such as 6 to 20 mSv for the dose which the population in other contaminated areas received. In one table, the collective dose for people living in contaminated areas are given, ranging from 35,000 to 100,000 mSv, the data have an index ^(a), which is easily overlooked; the corresponding footnote says that only the doses from 1986 to 1995 were examined, but that considering the longer period of 1996 to 2056, which would correspond to an observation period of 70 years, the collective dose would rise by 50%. Table II lists the data of the original study [3], taking into account this footnote by adapting the numbers for the collective dose and for additional deaths respectively according to the original work. The data transferred from Cardis and colleagues' work into the WHO report are to be found on the far right.

From this table it is evident that Cardis did not transfer the uncertainties into the WHO report. In her original study [3], she calculates from 9,785 to 22,160 additional cancer and leukaemia deaths within 70 years. The WHO report however, which refers explicitly to her study, gives only 8,930 within 95 years [2].

The press release of the Chernobyl Forum on the occasion of the conference in Vienna does not refer even to those 8,930 dead; consequently, they are not mentioned in any newspaper report on the conference. The press release mentioned and the media reported just 4,000 expected additional cancer deaths. The largest item in Table II, the deaths among people in 'other contaminated areas', was simply omitted.

The figure of 8,930 did however play a certain role in discussions at the conference. Not that there was any criticism of its sizeable diminution compared to the original study, but someone demanded the omission of the

Table II. Comparison of data from original study and the 2005 WHO working draft.

	Population size Number	Average effective dose mSv	Collective effective dose man Sv	Predicted excess cancer/leukaemia deaths	
				Original study Number	WHO report Number
Liquidators	200,000	100	20,000	2,200	2,200
Evacuated persons	135,000	10	1,600	160	160
Strict control zones	270,000	50–60	15,000–30,000	1,650–3,300	1,600
Other contaminated areas	6,800,000	6–20	52,500–150,000	5,775–16,500	4,970
Total				9,785–22,160	8,930

Sources: Refs 2, 3.

entire table because it might be misunderstood. Laymen would not consider that these dead would not be distinguishable among the much more numerous ‘natural’ cancer deaths: in reality, these were not actual deaths but calculation quantities, which should be ‘laid aside’ entirely. Klaus Becker, vice president of the German organisation Radiation, Science & Health, argued in this vein. Could someone please explain to Mr Becker what the concept of ‘stochastic radiation damage’ means?

Thyroid cancer

The Chernobyl Forum followed the line of argument reiterated by international committees and national authorities up to now – that there was a clear increase of thyroid cancer in children and young people, but nowadays there are good therapies for this unfortunate illness. It is forgotten that the children whose thyroid gland had to be removed must be supplied with medicine as long as they live. That may be a negligible problem in western Europe, but under the living conditions in Russia, Belarus and Ukraine it is certainly not. These children must regularly call at a specialised medical institution, to watch for recurrence or metastasis to other organs in the future. Many parents simply do not have the money for the necessary journeys to these hospitals. The forum ignores the fact that the thyroid cancer rate also rose dramatically in adults as clearly seen from Figure 1. In the area of Gomel in Belarus the thyroid cancer rate rose by 58 times in young people aged up to 18 years in the 13 years after the disaster compared to the 13 years before it. In the group aged 19–64 years, the thyroid cancer rate after the disaster was five to six times higher than before, and the absolute number of adults affected is much higher than that of the children [4,5]. The WHO report apparently does not consider this worth mentioning.

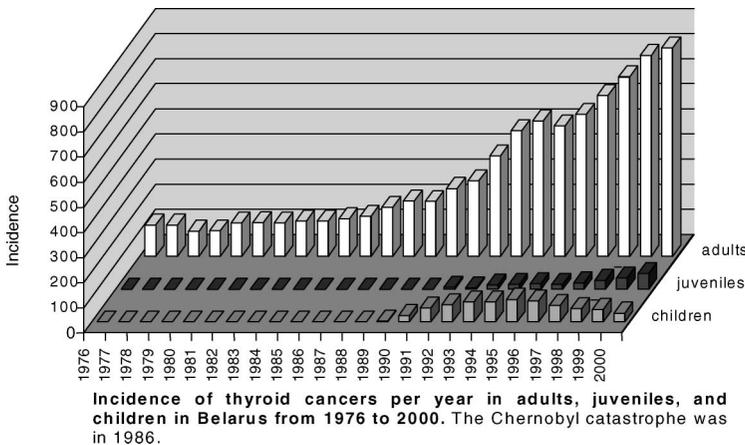


Figure 1. Thyroid cancer in Belarus. Sources: National Thyroid Gland Centre of Belarus and the Otto Hug Strahleninstitut MHM, Munich.

End of the debate?

The IAEA left little opportunity in Vienna to discuss these facts. However, several observers from the three states concerned strongly opposed the insinuations made by the speakers that everything worth knowing was known and the Book of Chernobyl could thus be shut. They rightly pointed out that the data from Hiroshima and Nagasaki had had to be studied for a much longer period and that several types of cancer were latent for decades. There was also criticism that archives of the underlying data are not available for independent research.

If media reactions are any indication, the conference certainly had some effect – the media obediently echoed the assertions that the damage to health was much smaller than originally feared, or that the effects could not be distinguished among the natural causes of death anyway, or that so far only 50 deaths could really be attributed to the Chernobyl disaster, and that the essential problem was poverty.

Meanwhile we have the first reactions from the three countries concerned. ‘If we talk about radiation effects, then I think that the number of 4,000 represents the maximum’, says the Information Director of the Ministry for Atomic Energy in Moscow, which does not have any interest in exaggerating radiation risks and casting aspersions on Russian reactor engineering. The comments of the Ukraine deputy minister for Disaster Control, Tatjana Amosova, were different. She said she could not agree with these data. The Ukraine had paid compensation to relatives of more than 17,000 people who were involved in the clearing up work and who had died in the past 19 years. Vladimir Tsalko from Belarus, the chairman of the Government Committee for the Consequences of the Chernobyl Disaster, said they could not accept the report and had many arguments on their side, nor could they agree with much of the data. Official representatives from Belarus and the Ukraine have announced a critical assessment of the report and made demands for changes in the final version of the text.

Acknowledgement

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