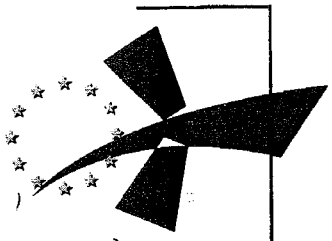

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What the Educated Public Wants to Know From Chernobyl

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Conferences of this sort tend to concentrate on what the experts in the field, especially those toiling in the vineyard, know and have recently discovered, often with jargon or esoteric detail. In this paper we will take a different approach and present some thoughts that we have encountered in our many interactions with the public.

Most of what the public is told about the effects of radiation is based upon the excellent work of Radiation Effects Research Foundation (RERF). This has a couple of logical deficiencies. Firstly, the effect is of a large dose received in a short period of time, whereas public interest is mostly about the effects of small doses spread out over a long period. Secondly, the way the dose at Hiroshima and Nagasaki are calculated retrospectively is still a matter of discussion - and the uncertainty is still perhaps as much as a factor of three.

The total exposure of the people exposed at Chernobyl to more than 30 Rems - measured in person-Rems - is considerably greater than the comparable exposure to the RERF cohorts. This leads to the possibility of addressing these issues.

It is now 10 years since the accident, and it should now be possible to make a preliminary assessment without impeding the more careful work that will take 50 or more years to complete. The public needs preliminary indications now.

In particular, we would like to see the following items addressed:

1. On Thyroid Cancers

a) How can one reconcile the incidence of thyroid cancer among children exposed near Chernobyl [1,2] with other data from

(i) Fallout from weapons testing [3]

(ii) Exposure during radiotherapy for skin hemangioma in infancy [4] where no significant excess was found.

(iii) Other radiotherapy for benign diseases [5,6]

(iv) Exposure to the Hiroshima/Nagasaki survivors

b) Is the thyroid cancer incidence larger or smaller among those who took potassium iodide (KI) pills? Is there a difference between those who took KI pills before or after the exposure? Since it is likely that there will not be reliable information on the point for all the affected populations, can we reliably define a subset for which it is known? [We note that there is prior evidence that KI pills taken before exposure may protect against exposure but KI pills taken after exposure may "lock in" the iodine and accentuate the dose.] There is also some indication that KI itself may be carcinogenic.

c) Are there any data before 1986 on iodine deficiency that can be used to try

to relate the thyroid incidence to thyroid deficiency? See, for example, Mityukova *et al.*, [7] who found mild thyroid deficiency after the Chernobyl accident.

d) It is important to continue to study thyroid cancer incidence among those who were children at the time of the Chernobyl accident. One possibility is that the incidence of childhood thyroid cancer will diminish with time - and be close to zero eight years or more after exposure. This would be expected if thyroid cancer incidence were similar to leukemia incidence.

e) How large is the population in which thyroid dose was measured in the first month after exposure? Is it large enough for a sensible study and a large enough fraction of those exposed to be sure that no biases exist? Does the work of Balonov and others from St. Petersburg in the region around Briansk enable us to get a fairly reliable measure of dose? [Noting here that if the dose is known to within a factor of 3, then the precision is comparable to that of the RERF data.]

It is widely believed that it is impossible to obtain good dose data because of the fact that in only a small proportion of exposed individuals was the dose measured. But it is important to realize that even if a group of children with tumors as small as 20 were well categorized, and this was a good statistical (random) sample of the population, one could obtain an accuracy greater than the factor of three that still plagues the RERF data.

f) What is the death rate among the unfortunate victims of thyroid cancer? Are the cancers similar to those naturally occurring in the USA? This would be a vital conclusion for assessment of risks of a nuclear power accident since most safety studies have assumed that 90% of thyroid cancers are non-fatal and can be cured. The results of the SEER program [8] are attached in Table 1 which suggests that few naturally occurring childhood cancers are fatal. Preliminary indications [9] are that the cancers in Belarus and Ukraine are more aggressive. Can this important detail be confirmed?

g) The above may have an important implication for the optimal treatment of these cancers and should therefore be discussed soon. There seems to be two contrasting viewpoints. One that radiation treatment is needed [10]. The other suggesting that aggressive treatments such as thyroid replacement should no longer be regarded as harmless therapy.

Table 1

Ages	Deaths (D)	Cases (Incidence I)	Ratio I/D
0-9	0	11	--
10-19	1	171	171
20-29	1	748	748
30-39	5	799	160
40-49	28	758	27
50-59	55	689	12.5
60-69	112	506	4.5
70-79	142	339	2.4
80-89	97	153	1.6
ALL	440	4,174	9.5

2. On Leukemias

h) In 1993 Ivanov *et al.*, [11] did not find an increase of leukemia attributable to Chernobyl. In 1995 Ivanov (private communication) reports a 30% overall increase in cancer in Belarus since 1986 compared to before 1986. If the increase is due to the Chernobyl accident, one expects it to be primarily in high dose areas. Is there any consistency? Are the data consistent with the numbers expected from the RERF data?

i) Can one categorize the leukemias by type (AML, CML, CLL and ALL)? If this cannot be done before 1986, can it be done for leukemias since 1986?

j) AML cases that occur subsequent to radiotherapy have been identified as having a specific DNA marker. Have any such markers been seen among those exposed at Chernobyl? Can one preserve tissue cultures to analyze for DNA markers at some time in the future?

k) In view of the fact that Chronic Lymphocytic Leukemia (CLL) has not been identified as being caused by radiation, it is of crucial interest to know whether CLL in Belarus has been observed to increase as much as other leukemias. We note that CLL is a slowly progressing disease and is believed to have a very long latency [12].

l) Even if the identifying of leukemia types before 1986 was not reliable, what is the identification since 1986? Does the CML/AML ratio vary with dose? Is this variation the same as seen in RERF?

m) Have other cancers been seen in excess? Would any have been expected by now on the basis of previous data?

3. Other Comparisons

n) How do the whole-body doses compare to the whole body doses from the exposures to the workers at the MAYAK plant at Kyshtym, to the villagers along the Techa River exposed to the releases from Lake Karachai, or to the population in the Altai exposed to nuclear testing fallout?

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