

# IRPA 10

## TOPICAL SESSIONS Reports of Co-Chairmen for Highlight Sessions

### ***T-12: Update of the Radiological Consequences of the Chernobyl Accident:***

#### ***Environmental Contamination Human Exposure and Health Effects***

*Tuesday, 16 May 2000*

Chair and Keynote: B. Bennett

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The Chernobyl accident that occurred in Ukraine in April 1986, led to the release of a significant fraction of the core inventory of some radio-nuclides, caused the death of 30 employees of the power plant and emergency fire fighters and led to a wide-spread contamination in areas of Belarus, Ukraine and Russia, and low-level contamination in most European countries. In addition to radiation exposure, the accident caused long-term changes in the lives of people, since measures to reduce the radiation exposure including resettlement, changes in food supply, and restrictions in activities of individuals and families were adopted for a large number of persons. The session was devoted to the present state of knowledge with regard to of contamination levels, the radiation exposures of specific population groups and the effects and consequences of the accident.

In the UNSCEAR 2000 Report an evaluation is made of the exposure and effects in population groups most affected by the accident. The results were presented in the first paper by Bennett et al.. The present findings are characterized by:

- Pre-existing and continuing ill health in the population
- General mortality increase
- General increase in cancer mortality that began before the accident

These effects are observed both in zones of higher contamination as well as lower contamination and seem to be not related to radiation exposure.

- Significant increase in childhood thyroid cancer (1800 cases up to now)
- No evidence of increase in cancer
- No increase in leukemia

Apart from the major increase of thyroid cancer in children, there is no evidence of a major public health impact that can be associated with radiation, 14 years after the Chernobyl accident.

Average effective doses in the higher contaminated regions of Ukraine, Belarus and the Russian Federation are estimated to be 6–11 mSv in the years 1986–1995 of which about 4–5 mSv are due to external exposure and about 2– 6 mSv are due to internal exposure. For the rest of the lifetime an additional exposure in contaminated areas at less than 2 mSv is expected. These apply to individuals who continue to reside in contaminated areas.

Generally, improved and more accurate evaluations of the exposures of the various population have been performed. This applies to all major groups exposed to ionizing radiation as a result of the accident, including, in particular, those with more significant exposures such as the population in the 30-km zone and other individuals evacuated, the liquidators and the populations continually residing in the higher contaminated areas outside the 30-km zone.

With regard to the latter group several evaluations have been performed in recent years. One was presented in the second paper of the session which showed a revision of thyroid dose data for children in Belarus based on individual interviews. Generally, it was shown that the doses for this population group varied significantly more than originally estimated. However, the average dose values were comparable to those that had been estimated previously, and therefore required no revision.

In the context of a dose reconstruction project of the European Commission a new approach to evaluate the internal doses to the population in the 30-km zone was developed. For this population group very little data, especially with regard to internal exposure, are available. By obtaining a consistent radionuclide vector that also included also short-lived radio-nuclides, a reconstruction of both the inhalation and the ingestion dose was feasible. It could be shown that the inhalation dose may contribute up to 13 times the external exposure levels for early evacuated individuals and up to 3 times for persons evacuated after 10 days. The internal exposure due to ingestion of contaminated foodstuff amounted to about twice the external exposure levels for adults, but up to 8-times external exposure levels in terms of effective dose. This permits a reconstruction of the average exposure on an individual village-by-village basis within the 30-km zone.

For another group of exposed individuals, the liquidators, some important issues with regard to their exposures have been investigated. One of the major open questions up to now was whether the dose data for this group as given in the official dose registries of Ukraine, Belarus and the Russian Federation are realistic estimates of doses for this group or are biased by efforts to terminate their occupation in the cleanup activities or promote their record as liquidator in order for them to obtain additional social benefits. In the paper by Chumak et al. it could be shown that the observed dose distribution of the liquidator group which shows a sharp edge just below intervention dose levels, seems to be realistically received doses. The conclusions were drawn by statistical analysis of the existing official dose records (ODR). This conclusion, however, does not imply adequate accuracy of ODRs in all respect. Since various methods were applied for dosimetric monitoring of liquidators and errors of the methods varied from 30 to >300 %, a further retrospective evaluation of dose uncertainties is required for the validation of ODR.

Generally, the major outcome of session T-12 was that considerable improvements in the evaluations of exposures received by the population involved were achieved in the past years. Dose values seem to be more reliable and a number of open questions have been answered guaranteeing more reliable dose estimates. This is particularly relevant for factors influencing the dose estimates such as

- the influence of short-lived radio-nuclides

- contribution of internal exposure to the exposure of evacuees from the 30-km zone
- the influence of individual behavior and consumption habits
- recording of dosimetric data for the liquidators, in particular for military and paramilitary units

Nevertheless, still some questions require further refined dose assessment, and work on the improvement of the dose assessment procedures is continuing.

An important outcome of the studies reported at this session was the evaluation of actual and perceived health effects. Thyroid cancer among children persists in the population of higher contaminated areas of NIS-states. At present about 1800 cases have been identified. On the other hand, there is no evidence of an increase in leukemia or solid tumors in the affected areas nor among the group of liquidators up to now. If such an increase were realistic, due to the shorter latency period of leukemia such an increase in occurrence should have been observable by now. The actual radiological consequences of the Chernobyl accident should be better publicized in order to offset the large amount of misinformation that persists about the Chernobyl accident. The accident was a social and economic disaster. But the radiation effects are, in fact, limited primarily to the thyroid cancers among children of the most heavily contaminated areas.