

SUMMARY
**of the Preparatory Meeting of NATO/CCMS Pilot Study: Risk assessment of
Chernobyl accident consequences: Lessons learned for the future**

Place: Istituto Superiore di Sanità (ISS), Viale Regina Elena 299, 00161 Rome, Italy,
October 23rd - 25th, 2003

Background: The Pilot Study represents the continuation of a collaborative scientific activity started on April 8th-12th, 2003, with the international workshop: “Risk assessment of Chernobyl accident consequences”, held in Kiev, Ukraine with 30 participants from Ukraine, Belarus, Russian Federation and Lithuania and 14 participants from western Europe and USA attended to the workshop (Austria, Germany, Greece, Italy, Portugal, Spain, US), respectively presenting 29 and 10 papers.

Aims of the meeting included:

- Discussion of the Pilot Study program.
- Preliminary collection of synthetic data, evaluations, assessments on the above listed points, provided by participants, in order to produce a first document to be submitted to a larger meeting.
- Organization of the first extended Pilot Study meeting to be held in 2004 in Eastern Europe in Kiev.

Preparatory group has discussed the current state of knowledge and outline of the Pilot project “Risk Assessment of Chernobyl Accident Consequences: Lessons Learned for the Future” presented by co-directors Dr. G.A. Zapponi (Italy) and Dr. C.C. Travis (USA).

Dosimetry

The Chernobyl accident resulted in widespread radioactive contamination on the territories of Belarus, Russia and Ukraine. The main radionuclides were ¹³⁷Cs and ¹³¹I. The accident led to unprecedented exposure of the population of Belarus, Russian and some other countries. The complex spatial, temporal, professional and age specific structure of exposure and the combination of external and internal exposure has no analogy.

In 2001 the number of exposed in the Ukraine is more than 2.5 million:

clean-up workers	- 240,800;
evacuees	- 56,377;
residents of contaminated territories	- 1,8 mln.;
children born from irradiated parents	- 502,377.

In Belarus the number of exposed is 1,7 mln.:

Clean-up workers	- 120,000;
Evacuees	- 22,000;
Residents of the contaminated territories	- 1,5 mln.;
Children from irradiated parents	- 16,400.

In Lithuania registry includes 7,139 clean-up workers .

There are different dose estimates for clean-up workers in different countries. All the sources agree that in 90% of clean-up workers doses are below 200 mSv. Of this dose more than 60% was external irradiation.

During the 15 years after the accident, most of the local population living in the contaminated areas has already received 60-80% of their anticipated life-time dose. For the majority of population of the territories contaminated with radionuclides annual doses do not exceed 5 mSv. In these areas the main dose-related radionuclide in the next 10-20 years will be ^{137}Cs , accounting for up to 90 % of the total additional exposure. The internal dose, caused mainly by the consumption of locally produced foodstuffs accounts on average for 40-60% of the total "Chernobyl" dose, and in critical areas – up to 95%. Last years of research have revealed anomalies of radionuclide transfer when low levels of radionuclide contamination are associated with an increased incorporation. Dosimetry passportisation data for these areas have to be re-assessed. Role of soils have to be encountered. Future efforts have to be on analysis of uncertainties of reconstructive dosimetry and its validation by biological dosimetry methods. Effective risk assessment strategies have to be elaborated for practical use in nuclear industry for reactor decommissioning and as a first step for reconstruction of Shelter object.

Additional information has to be collected on the health effects in areas with combination of accidental exposure with elevated levels of natural irradiation.

Cancers after Chernobyl

The presence of a number of stochastic effects caused by the influence of ionizing radiation, characteristic for the Chernobyl accident, has been proven and recognized by the international scientific community. The significant increase in the number of radiation-induced thyroid cancers in children and adolescents in Belarus, Russia and Ukraine since 1990 continues to this day. A further significant increase in the number of thyroid cancers in adults is to be expected in the coming decade for those exposed as

children. Data from Ukrainian and Belarusian registries show the elevated incidence of thyroid cancer in radiation recovery workers, evacuated population and the population of the contaminated territories irradiated at the adult age. Total numbers of thyroid cancers in these groups exceed figures for children. Health care system has to extend screening measures for these groups for risks reduction.

Leukemia incidence is referred to be the most sensitive parameter of radiation-induced stochastic effects. The increase in the incidence of leukemia above the spontaneous level among clean-up workers reported in Russia was strongly opposed due to absence of efficient validation system and inability to confirm results in a case-control study. Belarusian data presented at the preparatory meeting showed increased risks of leukemia and thyroid cancer for Belarus radiation recovery workers as a time function for those who had experience of clean-up works from 1 to 6 months. Ukrainian cancer registry data showed an increase of leukemia rates in recovery workers. In Ukraine an international hematology review held by NCI (USA) and RCRM (Ukraine) has showed a sufficient quality of diagnosis in Ukraine for main types of leukemia. A case-control study is performed in a cohort of more than 110,000 Ukrainian radiation recovery workers for a 15-year period after the accident and will be finished at 2004. On the basis of preliminary studies there are indications that there is an excess of radiation-induced leukemia in recovery workers but it's too early to make the final decision.

Ongoing studies including French-German Initiative started at 1998 haven't shown an increase of radiation-induced leukemia in other groups of population including children. There is some preliminary data showing the elevated risks in children with a prenatal exposure, so there is a need in thorough scientifically based evaluations. Extending of studies and possibly integration of registries are recommended to increase the power of risk estimates.

The existing epidemiological studies and evaluations relative to cancer effects, other than children thyroid cancer, have provided not fully consistent results. The increase, according to the data of Ukrainian and Belarus registries, in the incidence of some forms of solid cancers (breast cancer, urine bladder cancer, lung cancer, colon cancer) among the clean-up workers requires detailed risk assessment. For the inhabitants of the contaminated areas statistically significant excess was shown only for cancer rates in total.

It seems important to further investigate these aspects, in order to carry out a comprehensive cancer risk evaluation, also considering the still existing uncertainties. The information on the effects identified in other radiation-exposed populations could also provide an appropriate framework for this task.

Non-Cancer Endpoints

A number of non-cancer endpoints possibly radiation related are of concern following the Chernobyl accident. Effects in radiation emergency workers and population of the contaminated territories include progressing deterioration of health of recovery workers of 1986-1987 years in three countries; a statistically significant excess of non-tumor diseases in comparison with national levels. Special attention in the ongoing research has to be dealt to the assessment of risks of nervous, cardiovascular, respiratory and digestive system diseases, stable changes of immune function and metabolism. Comparisons have to be done of mortality rates and risks of non-tumor diseases with data obtained on Japanese cohort of hibakushi.

Effects on Children

To date, studies on possible genetic disorders, hereditary diseases and congenital development anomalies attributable to the influence of the radiation characteristic of the Chernobyl accident have not been sufficiently developed or financed. At present the only study of irradiation effects on brain *in utero* is conducted in the frame of French-German Initiative in Ukraine. Similar project in Russia failed to start. Belarus data showed no significant effects.

A lot of data has been reported on the deterioration of health conditions of children inhabiting territories with contamination higher than 37 kBq/m² indicating established relationships with the place of residence but not with irradiation doses. It is therefore essential to strengthen research in this direction. Special attention has to be paid to the children of radiation recovery workers and to children who were exposed *in utero*. Further studies have to determine genetic predisposition to radiation induced thyroid pathology (cancer, autoimmune thyroiditis).

Psychological Effects

A number of non-radiation related health effects have appeared in affected populations as a result of the social, cultural and psychological stress caused by the accident the Chernobyl accident. In zones of radioactive contamination of Belarus, Russia and Ukraine the negative demographic tendencies develop. Decrease of birth rate, deterioration of reproductive health of women, growth of frequency of complications of pregnancy and sorts, decrease of quality of health newborn is observed. Risk assessment and modeling strategies have to be directed to quantitative estimations of the input of social condition deterioration, psychological and phobic reactions and their influence on food practices.

Preparatory group has agreed to organize the next NATO/CCMS meeting in Kiev in 2004 (month has to be determined) to make conclusions and plan the activities for a two-year period. Research Center for Radiation Medicine agreed to organize a meeting.

