

# **PILOT STUDY “RISK ASSESSMENT OF CHERNOBYL ACCIDENT CONSEQUENCES: LESSONS LEARNED FOR THE FUTURE”**

## **Summary Report of the Meeting held in Kiev, June 21- 23, 2007**

The Pilot Study meeting was held at the Research Centre for Radiation Medicine of Ukraine, in Kiev. The organization has been cared by Prof. Dimitry Bazyka (Pilot Study Ukrainian coordinator), vice director of the Centre, with the participation of 36 Ukrainian experts, 1 Italian (Pilot study coordinator), 1 US (expert in psychology and risk perception-communication) and 4 participants from Slovakia. Two other US participants could not be present, but ensured their interest and the availability to contribute to the study.

The meeting was aimed at discussing recent research results, reviewing and updating the work carried out, and defining the structure of a book on the Pilot Study results.

The meeting program is reported in the Annex 1 and the list of participants in Annex 2.

### **PRESENTATIONS BY THE VARIOUS SPEAKERS**

The new contributions included recent epidemiological data and evaluations concerning cancer and non-cancer diseases in various population groups (clean-up workers, general population with specific attention to children). Exposure and dosimetry data, risk evaluation in specific areas, the influence of dietary habits on the internal exposure, and other topics have also been discussed. A re-examination of the external and internal radiation doses and of the associable solid cancer risk in different 7 “Oblasts” and 45 “Raions”, with general dosimetry certification has been presented. In these territories, about a 13% of the whole population (raions with > 20 mSv exposure) is bearing about the 36% of the estimated risk (in terms of expected cases). In some areas the internal exposure for the 1986-2005 period accounted for the 60%-90% of the whole exposure, while for other areas the internal exposure contributed for a much lower fraction. The exposure variability among the various Raions making part of the 7 Oblasts is characterized by a geometric standard deviation (GSD) up to 1.6 – 2.1, indicating a remarkable uneven distribution in particular in 3 Oblasts. For instance, in the 3 most contaminated Raions of Rivnenska Oblast (Dubrovtsky, Zarichnensky and Rokytnivsky, with total dose > 20mSv), the elimination or a high reduction of the internal dose could have led to a risk reduction of 3-fold or more. Assuming a major role of diet for the internal exposure, this could have implied the provision of uncontaminated food for about 117'000 people for 20 years (only for less than one half of a single Oblast). Obviously, this is a very difficult and costly task, that, however, needs to be considered in the strategy of accident emergency response.

Further suitable indications of a leukaemia risk increase in the clean-up workers emerged. Moreover, up-dated information on still existing thyroid cancer risk in different population groups, mostly related to past exposure, has been presented for different population groups. Epidemiological data on various cancer incidences are also supported by Ukrainian biological studies on relevant parameters (e.g., molecular genetic alteration, immunoglobulin genes expression, other). An updated evaluation of children risk (in early age, *in utero*, etc.) has been presented, confirming the need of a specific and efficient protection of this subpopulation.

Various and significant non-cancer effects have been assessed in the clean-up and recovery workers (“liquidators”), also inducing an increased mortality. A significant mortality increase for circulatory diseases has been associated to radiation doses received during their activity. Obstructive pulmonary diseases, mental health and neuro-psychiatric diseases, cataracts, and other diseases have been identified. These results are compatible with the epidemiological data on the Atomic Bomb Survivors (ABS), that have clearly indicated the existence of a significant non-cancer

risk within the consequences of radiation exposure. Various of non-cancer effects have been identified also for other population groups. Further study is ongoing on these topics.

Dosimetric studies, also associated with epidemiological data have been presented, also indicating the more effective procedures, among which the retrospective dosimetry methods, of main importance for population protection.

Various new studies on radiation effects at molecular level have been carried out, providing criteria for risk identification and screening.

Moreover, demographic and social data showing trends and post accident evolution of relevant parameters of the Ukrainian population were presented, underlining that social disruption aspects have to be considered within the accident consequences. Psychological effects and impacts, risk communication procedures, criteria to be adopted in similar case have been presented and discussed. These latter results clearly indicate that the Chernobyl accident has seriously impacted on all the three points that the WHO has indicated in the definition of Health (Physical, Psychological and Social well being).

NOTE: Lastly, as a general comment, it is worthwhile underlining that, as reported by the IARC-coordinated study (Cardis et al., 2006) “Estimates of the cancer burden in Europe from the radioactive fallout from the Chernobyl accident”, the attributable fractions of cancer risk estimates generally are considerably low, even not negligible, and the possibility of an epidemiological verification is very limited. However, the IARC-coordinated retrospective epidemiological cohort study in 15 countries, on more than 400 thousand workers (Cardis E, 2006, 2007), characterized by a very high “statistical power”, has confirmed the low-dose risk estimate procedures and indicated a small but significant excess risk even at the dose rates typically received by nuclear workers, whose exposure is in order or lower than the one of many Chernobyl accident affected populations. Therefore, the available risk estimation may not be neglected, even if not verified through geographical studies (much less powerful than the mentioned nuclear worker cohort study).

## **PROPOSED STRUCTURE OF A BOOK AIMED AT PRESENTING THE WHOLE PILOT STUDY RESULTS** (about 300 pages, to be finished within 1 year)

1. **Premise.** General review of all previous studies of various Agencies and Organizations on the Chernobyl accident consequences (UNSCEAR; French German Initiative for Chernobyl (1988-2004); summaries of the International Conferences held in Kiev at 15 and 20 years after the accident; the various IARC-coordinated studies on Chernobyl accident-related cancer burden estimates, the cancer consequences after 20 years, the radiation exposure in Europe; the TORCH report - The Other Report on Chernobyl - by European "Greens", the Greenpeace document, other).
2. **Radiation exposure and dosimetry:** for different population groups, its time evolution, projections for the future (critical review of official doses, implementation of new assays, dose reconstructions in leukaemia and cataract studies, elaboration of a fast automated assay at low dose interval. Dosimetry of radionuclide incorporation. Ecological dosimetric studies.
3. **Health effects:**
  - Cancer:**
    - Thyroid Cancer, Leukaemia, Solid Cancers (children, clean-up workers, evacuated and exposed population)
  - Specific effects on children:**
    - Exposure scenarios, somatic effects, children exposed *in utero*, genetic effects, brain effects, other.
  - Non cancer end points:**
    - **Acute Radiation Syndrome:** Morbidity and mortality, early diagnosis, brain and vegetative dysfunctions, cases re-evaluation on 20 year basis experience, ARS at low dose (500 mSv ?).
    - **Circulatory diseases:** Cardiovascular, cerebrovascular.
    - **Nervous System:** Epidemiological and clinical data
    - **Immunological effects:** Endocrine function and Metabolism.
    - **Psychological and social effects:** Clean-up workers, evacuated and relocated population, population still resident in contaminated areas, mother and children, other.
    - **Demography and health:** Birth and mortality trends, social disruption, population decrease, emigration, other.
4. **Risk analysis:** exposure patterns, health effects, risk reduction strategies, past and future risk, risk distribution and unevenness, groups and subjects at higher and lower risks, other.
5. **Review of adopted protective action and emergency response decisions:**
  - **Initial decisions:** Shelter, evacuation decisions and timing, use of potassium iodide, countermeasures, other.
  - **Later decisions:** relocation of citizens, opening of closed areas, emergency response for children protection, countermeasures, other.
6. **Lessons learned:** Critical review and experience-based remedial strategy proposals emerging from all the previous points for similar accidents and intentional events.

## **PROGRAM OF THE WORKSHOP**

**“Risk assessment of Chernobyl accident consequences. Lessons learned for the future”  
21-23 June 2007. Kyiv, Ukraine.**

### **Day 1-st: 21 June 2007**

10.00-11.00 Registration of participants

#### **Plenary session**

- **11.00-11.30. Welcome address: Prof. V.G. Bebeshko, Prof. Bazyka D.A. (Ukraine),**
- **Prof. G.A. Zapponi (Italy)**

#### **Section 1 - Health effects. Non-tumor consequences.**

**11.30-11.50. V.A. Buzunov, L.I. Krasnikova, V.M. Tereshchenko, Yu. S. Voychulene (Ukraine).** Epidemiological study and assessment for influence of radiation and non-radiation factors on development non-tumor diseases in clean-up workers of Chernobyl NPPA.

**11.50-12.10. D.A. Belyi (Ukraine).** New criteria for radiation damage severity in humans in middle and high dose range.

**12.10-12.30. V. A. Sushko, L.I. Shvaiko, K.D. Bazyka, A.S.Ryazhskaya (Ukraine).** Chronic obstructive pulmonary disease in liquidators of Chernobyl catastrophe. Results of twenty years of monitoring, lessons and future trends for studies.

**12.30-13.00. Discussion.**

#### **13.00-14.00. Lunch.**

**14.00-14.20. E.I. Stepanova (Ukraine).** Summary report of Chernobyl accident effects on children health

#### **Section 2 - Demografy effects.**

**14.20- 14.40. M. I. Omelyanets, N. V. Gunko, N. Dubova (Ukraine).** Mortality trend of the population of radioactively contaminated zones of Ukraine after the Chernobyl catastrophe.

#### **Section 3 – Health effects. Psychological effects**

**14.40-15.00. K. N. Loganovsky(Ukraine), J. M. Havenaar (Netherlands), E.J.Bromet (USA).** Mental health of liquidators.

**15.00-15.20. K. N. Loganovsky, Ye. Antipchuk, M. Bomko, N.Yu. Chuprovskaya T. Loganovskaja, N.V. Denisyuk, L.L. Zdorenko (Ukraine).** Neuro-psychiatric consequences of Chernobyl accident: lessons to be learned.

#### **15.20-15.40. Coffee-break**

#### **Section 4 – Dosimetry**

**15.40-16.00. M.V. Naboka, V.M. Shestopalov, A.A.Lihosherstov, A.P.Kravez, E.V. Chaban (Ukraine).** The lessons of Chernobyl: dosimetric and epidemiological study.

**16.00-16.20. V.V.Chumak (Ukraine).** Dosimetry: tested methods, efficiency, results.

**Day 2-nd: 22 June 2007**

**Section 5 - CCMS/NATO Member Country speakers**

**10.30-10.50. G.A. Zapponi (Italy).** Solid cancer risk estimates in regions of general-dosimetry certification following the Chernobyl accident (7 Oblast, 45 Raion, 1986-2005)

**10.50-11.10. A. Speckard (USA):** Psychological impact, risk perception, risk communication, data from intentional attacks.

**Section 6 –Health effects. Cancer and molecular-genetic effects.**

**11.10-11.30. A.Ye.Prysvazhnyuk, M.M. Fuzik, A.Ye.Romanenko, K.M.Slipenyuk, Z.P.Fedorenko, L.O.Gulak, Ye.L.Goroh (Ukraine).** Thyroid cancer risk assessment in different Ukrainian population groups in post-Chernobyl accident period.

**11.30-11.50. Romanenko .Ye., Bebesko V.G., Bazyka D.A., Gudzenko N.A., Dyagil I.S., Chumak V.V. (Ukraine).** Epidemiological study on leukaemia in clean-up workers : preliminary results and perspectives.

**11.50-12.30. Coffee-break**

**12.30-12.50 A. Chumak, I. Abramenko, N. Bilous, E. Davidova, I. Kryachok , I. Dyagil. Z. Martina, S. Nechaev , D. Bazyka, V. Bebesko (Ukraine).** Analysis of expressed immunoglobulin heavy chain genes in chronic lymphocytic leukaemia patients exposed to ionizing radiation due to Chornobyl NPP accident.

**12.50-13.10. V.V. Talko (Ukraine).** Radiobiological aspects of antioxydative protection.

**13.10-13.30. S. Andreychenko, A. Klepko, O.Petrova, V.Bulavitska, N. Nurishchenko (Ukraine).** Peculiarities of post-radiation recovery in gametes following gamma-irradiation.

**13.30-13.50. A.N. Kovalenko (Ukraine).** Tumour and non-tumour effects observed during 21 years in victims of the Chernobyl NPP accident.

**13.50-14.50. Lunch**

**14.50-15.10. S. V. Klimenko, D.A. Bazyka, V.G. Bebesko (Ukraine), J. Smida, M. Atkinson, K. Trott, M. Rosemann (Germany).** Molecular genetic alterations in radiation-associated acute myeloid leukemia following the Chornobyl accident

**Section 7 - Nourishment and irradiation effects**

**15.10-15.30. I.T. Matasar, I.A. Gorchakova (Ukraine).** Influence of diet on internal irradiation doses for the population living in radionuclide polluted territories.

**15.30-16.15.** Discussion.

**Day 3-d: 23 June 2007**

**10.00-12.00 Discussion of all sections work and of the preparation of workshop summary.**

**The lessons for future:** Prof. V.A.Buzunov, prof. Ye.I. Stepanova, Prof. A.A. Chumak, Prof. K.N. Loganovskiy, Prof. V.V.Chumak, Dr M.S. S.V. Klimenko.

**12.00-12.30 Coffee-break**

**Summary and final comments the workshop, proposal and discussion of the Pilot Study Final Report :** Prof.G.A.Zapponi, Prof.. D.A.Bazyka, others.

**12.30 Closure**

## LIST OF PARTICIPANTS (SPEAKERS AND AUDITORS)

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