
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 37 participants from Ukraine, Belarus, Russian Federation and Lithuania and 4 participants from western Europe and USA attended to the workshop, respectively presenting 31 presentation.

Planning Committee meeting was conducted in Rome. The Scope of Preparatory Meeting was the discussion on the Pilot Study program and 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 and organization of the first extended Pilot Study meeting to be held in 2005 in Eastern Europe in Kiev.

The context of the planned CCMS Pilot Study meeting:

This meeting is a part of the CCMS Pilot study “Risk Assessment of Chernobyl Accident Consequences: Lessons Learned for the Future” (Co-Directors - Dr. G.A. Zapponi, Italy and Dr. C.C. Travis, United States).

Major conclusions of the Rome planning meeting were:

Extent of Contamination
The Chernobyl accident resulted in widespread radioactive contamination to the territories of Belarus, Russia and Ukraine. More than 5 million persons living in the Ukraine and Belarus experienced some level of exposure to radiation.

Dr. Bazyka summarized the data from Ukraine.
About 5% of the total land area of the Ukraine was contaminated by the Chernobyl accident. However, this area contains 12% of the agricultural land and 40% of forestland. An estimated 3.1 million people are currently living in the contaminated areas.

Dr. Kruck summarized the data from Belarus.
The situation is similar to the one of Ukraine, but worse. About 15% - 20% of the land area of Belarus was contaminated by the Chernobyl accident. This area contains maybe 25% - 30% of the agricultural land and 45% of the forestland. As mentioned by Dr. Kruck, Belarus has higher percentages of land and people contaminated in a context of fewer resources (medical, physical, economic).
An estimated 1.5 million people are currently living in the contaminated areas.

Dosimetry
The main radionuclides involved in human exposures were 131-I and 137-Cs. Estimates of dose are uncertain, but efforts continue to improve dosimetry data. It is generally believed that 90% of clean-up workers received doses below 200 mSv and that more than 60% of the dose to clean-up workers was from external irradiation.

In the 19 years since the accident, most of populations living in contaminated areas have already received about 50-60% of their anticipated lifetime dose. The major source of future exposure will be via consumption of locally produced foodstuffs. For populations currently living in contaminated territories, annual doses generally do not exceed 5 mSv.
Over the next 10-20 years, the main exposure will be to Cs-137, accounting for up to 90% of the total additional exposure. The problems of dose reconstruction and of its uncertainties are well recognized. The estimated mean red bone marrow dose, for the 1986-1990 period, is 109 mGy, with a standard deviation of 266 mGy and a range from zero to >1000 mGy (non-normal statistical distribution). These topics need more work, and at the next meeting in Kiev new data will be available.

**Thyroid Cancer**

The most dramatic cancer effect following the Chernobyl accident was the significant increase in radiation-induced thyroid cancers in children and adolescents. The number of thyroid cancers in children and adolescents continues to increase, as older children are now developing thyroid cancer. Thyroid dose estimates for these children range from 1 mGy to more than 20 Gy. A similar study in Russia found a median thyroid dose of 0.6 Gy for the thyroid cancer cases and 0.2 for the controls. These dose estimates confirm the sensitivity of young children to low radiation exposures. Prof. Kenigsberg reported a summary of radiation effects in Belarus:

<table>
<thead>
<tr>
<th>Thyroid Cancer in subjects</th>
<th>0-18 years of age</th>
<th>19+ years of age</th>
</tr>
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<tbody>
<tr>
<td>1986-1989</td>
<td>0.1-0.5/100 000</td>
<td>2.14/100 000</td>
</tr>
<tr>
<td>2002</td>
<td>7.7/100 000</td>
<td>14.5/100 000</td>
</tr>
</tbody>
</table>

For the cohort of 0-18 year olds
- **Ear**
  - female: 3.4
  - male: 2.7
  - The risk in females was greater than in males.

<table>
<thead>
<tr>
<th>Attributable risk</th>
<th>0-18 year olds</th>
<th>19+ year olds</th>
</tr>
</thead>
<tbody>
<tr>
<td>female</td>
<td>76.5%</td>
<td></td>
</tr>
<tr>
<td>male</td>
<td>15.6%</td>
<td></td>
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</tbody>
</table>

The problem now is to get the dose estimates so that a dose response curve can be made.

Thyroid cancer is now beginning to show up in adults, and, in the future, it is expected that the number of thyroid cancers in adult population groups will exceed figures for children. Dr. Kenigsberg reported that in Belarus thyroid cancer rates continue to increase in all age groups. As above shown, Dr. Kenigsberg estimates the Excess Relative Risk per Gy for children to be 14. There are preliminary indications that the dose dependencies of the Chernobyl thyroid cancers are not inconsistent with the observations in Hiroshima and Nagasaki, but it is too early to say definitively. As better dosimetry data become available, this question may be answered.

**Leukemia**

Leukemia incidence is considered to be the most sensitive indicator of radiation-induced stochastic effects. Belarusian data show increased risks of leukemia and thyroid cancer for Belarus radiation recovery workers. Ukrainian data also show an increase of leukemia rates in recovery workers, although no increase has been detected in the general population.

A large multinational case-control study of Chernobyl radiation exposures and risk of acute leukemia is nearing completion and the results should be available this year.

**Breast Cancer**

There are indications of an increased rate of breast cancer among female cleanup workers. Further investigation of this issue is needed. IARC has begun a case control study of breast cancer in 73,600 women and 11,300 girls under the age of 15.

**Non-Cancer Endpoints**

A number of possibly radiation-related non-cancer endpoints are of concern following the Chernobyl accident. In zones of radioactive contamination in Belarus, Russia and Ukraine, negative demographic tendencies continue to develop. A
continuing decrease in life expectancy is noted in radiation emergency workers and populations from the contaminated territories. There are indications of an increase in cardiovascular, respiratory and digestive system diseases. It was reported at the meeting that heart disease is increasing. Vascular eye pathology is detected in 87% of cleanup workers. It was also reported that radiation cataracts have been found in cleanup workers, with a linear response down to 100 mGy. (One hundred percent of cleanup workers with Acute Radiation Syndrome have developed cataracts). These data suggest a stochastic basis for radiation-induced cataracts, as opposed to the deterministic model (which implies the existence of a threshold) now used by the National Council on Radiation Protection (NCRP) and the International Council on Radiation Protection (ICRP). This may be an important new piece of information learned from the Chernobyl studies.

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 Chernobyl accident.

Ecosystem Effects
Dr. Mousseau summarized his work on barn swallows in contaminated areas of the Ukraine. Barn swallows are migratory, but return to the same breeding area every year so breeding populations can be followed year after year. Reductions in barn swallow reproductive performance and adult survival (a 60% decrease over controls) were found in contaminated areas, implying that the population is not self-sustaining. Isotopic profiles in feathers indicate that population numbers are being maintained primarily by an influx of new birds. Radiation exposure is causing a decrease in antioxidants levels and an increase in mutations and abnormal sperm in these populations. Dr. Mousseau also noted an absence of orchard fruits, related to an absence of pollinating insects such as bees.

Lessons Learned
The second and third days were devoted to discussion of lessons learned from the Chernobyl accident, and to planning for the next meeting in Kiev, Ukraine. It was agreed that there is a need to publish more of the Chernobyl research in international journals. Most of publications on the topic are in Russian and only in part in English, also due to the need of easily communicating to local experts. However, no easy solution was seen for this problem. It was suggested that there should be a workshop in the Kiev meeting on methodological issues related to Chernobyl research. Drs. Miller and Nelson suggested possible lessons learned. However, more thought is needed on this issue.

Conclusion
The meeting of the Planning Committee was very successful and accomplished its aims. The Planning Committee was able to summarize the current state of knowledge regarding health impacts of the Chernobyl accident. This summary will serve as a guide for organizing the speakers and topics for the second workshop on Chernobyl Lessons Learned. The Research Center for Radiation Medicine has agreed to host the second workshop in Kiev, Ukraine.