

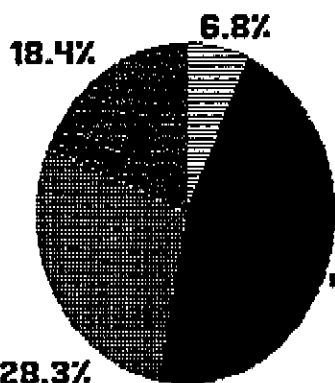
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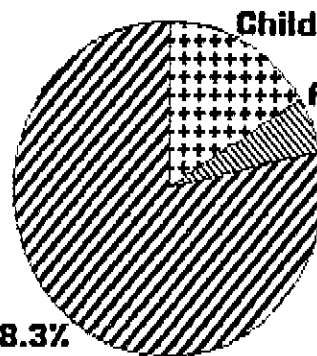
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WORLD HEALTH ORGANIZATION

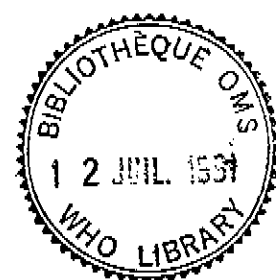
INTERNATIONAL PROGRAMME ON THE HEALTH EFFECTS
OF THE CHERNOBYL ACCIDENT
(IPHECA)



531,000
persons



TECHNICAL DESCRIPTION
GENEVA 1991





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I. THE JUSTIFICATION FOR AN INTERNATIONAL PROGRAMME

1. The Chernobyl accident was the largest radiation disaster in the nuclear industry and involved millions of people.
2. This accident has substantially changed the environmental radiation in large stretches of territory.
3. Unique experience has been accumulated since the accident happened. A number of important radiation health and medical problems have been resolved.
4. However, along with the unresolved problems, additional ones have emerged as the radiation situation has been more accurately assessed.

These include:

- a detailed reconstruction of radiation doses to provide a more accurate prediction of health effects;
 - the present and future health of the population (particularly children) exposed to radiation and other factors;
 - optimization of decisions and measures undertaken to minimize the health consequences of the accident;
 - aggravation of the socio-psychological situation;
 - identification of the contributions to morbidity from radiation and non-radiation factors.
5. Review of the experience to minimize the health consequences of such a large-scale accident is of great value not only for the USSR, but also for other countries. This is why the research on the health effects of the accident and development of a set of practical measures on the health care of the population requires the joint efforts of scientists, specialists and physicians from many countries, integrated into an international programme. A number of institutions from various countries have already expressed their interest to participate in such a programme.
 6. Besides achieving its major targets in health protection, the implementation of the programme would enrich fundamental research and applied science over a wide range of disciplines.
 7. According to its mandate, WHO is an organization coordinating international health work and furnishing necessary aid in emergencies. Thus, it is appropriate that the programme be carried out under WHO auspices.
 8. To carry out the programme effectively it is essential to establish an international centre for radiation health issues. The structure of the centre will be finalized later and issued as a separate document.
 9. The programme could contribute to the coordination and integration of specific projects in this field, in particular, those based on bilateral agreements between the USSR and other countries.
 10. The programme will bear the title "International Programme on the Health Effects of the Chernobyl Accident" (IPHECA).

II. PROGRAMME OBJECTIVES

1. To unite the efforts of researchers, specialists, physicians and health services of WHO Member States in the investigation of the health effects of the Chernobyl accident and the improvement of care for those affected, including psychosocial rehabilitation.
2. To extend basic knowledge in radiobiology as well as in epidemiology, psychiatry, neurology, pathology, carcinogenesis, immunology, endocrinology, genetics, haematology and medical and social psychology, as they relate to radiation effects, especially at low level exposure.
3. To contribute to the improvement of medical preparedness of WHO Member States for radiation emergencies drawing upon experience of the Chernobyl accident.
4. To harmonize methods of radiation epidemiology and further develop data bases for health status evaluation and projection.
5. To improve public understanding and facilitate the education of health professionals and the population on radiation hazards.

III. MAIN DIRECTIONS OF THE PROGRAMME

1. Health status of the population exposed to radiation and/or affected by other factors associated with the accident.
2. Methods for the diagnosis, prevention and treatment of diseases which may be induced by radiation and the study of the specific features of their clinical course.
3. Initial stages of oncogenesis, pre-leukaemic states and myelodysplasia, and their relation to immunological, genetic and chromosomal disorders induced by ionizing radiation.
4. Collection, collation and analysis of dosimetric data, demographic and epidemiological information, study of the morbidity and mortality distribution with the aim of evaluating the intervention levels, the theoretical predictions made and countermeasures taken for limiting possible health consequences.
5. Effects of exposure to radioiodine on the thyroid, preventing and treating possible diseases.
6. The modifying influence of man-made and natural environmental factors, nutritional and harmful habits on the health of individuals affected by radiation.
7. Psychological, psychiatric, neurological and functional disorders associated with and caused by the accident, and their prevention and treatment.
8. Long-term radiation effects at the subcellular, cellular, organic, somatic and population levels, in particular the induction of leukaemia and other neoplasms, thyroid disorders, developmental anomalies and genetic defects.

9. Temporal and spacial patterns of individual and collective dose distribution for different groups affected by radiation.

10. International intercomparison and harmonization of methods in computational, physical and biological dosimetry of external and internal irradiation. Development of large-scale systems for the collection, verification and processing of dosimetric and radioecological information.

12. Development of software packages to maintain very large medical and dosimetric registries of affected individuals.

International activities are planned in a wide range of scientific and clinical disciplines. The topics to be considered are specified below while these would not all enjoy equal priority.

1. EPIDEMIOLOGY

1.1 Health studies of the monitored groups, including assessment of mental health, through an epidemiological registry, clinical and laboratory examinations, and the processing of health statistics data.

1.1.1 Standardization of data collection and consolidation of models used in radiation epidemiology of cancer and other illnesses.

1.1.2 Investigation of the incidence of tumours and other diseases of the thyroid in children.

1.1.3 Investigation of the morbidity and mortality from leukaemia and other cancers in representative groups.

1.1.4 Comparison of the morbidity related to radiation with that related to other factors.

1.1.5 Long-term follow-up of various groups exposed to radiation:

- persons involved in recovery operations following the Chernobyl accident;
- those evacuated;
- the population living in contaminated areas;
- pregnant women and children born to parents exposed to radiation.

1.2 Study of the environmental factors, nutritional factors, harmful habits and specific features in the life-style which can modify health indicators.

1.3 Analysis and review of information on the health status, radiation doses and the influence of modifying factors; establishment of possible cause-effect and dose-response relationships.

1.4 Predictions for the health status in various monitored groups; elaboration of methods and techniques for the large-scale prevention of possible adverse effects.

1.4.1 Justification of approaches in evaluating the risk of stochastic effects with allowance for the combined action of radiation and non-radiation factors.

2. PREVENTION, DIAGNOSIS AND THERAPY OF DISEASES IN AFFECTED AREAS

2.1 Study of the early stages of oncogenesis, pre-leukaemic states and various dysplasias; their link with the immunological, genetic, and chromosome disorders induced by ionizing radiation.

2.2 Development of methods to diagnose, prevent and treat radiation-induced diseases possibly associated with radiation, and study of their specific clinical course.

2.3 Development of methods for the intensive combined therapy of haemoblastoses and haematopoiesis depression.

2.4 Study of possible long-term radiation effects in the thyroid with a view to the early detection of hypothyroidism, thyroiditis, and benign and malignant tumours.

3. MATERNAL AND CHILD HEALTH

3.1 Pregnancy, delivery and postnatal disorders.

3.2 Teratogenic effects including mental retardation.

3.3 Effects of parental radiation exposure prior to conception.

3.4 Morbidity among the newborns whose parents had been exposed to radiation.

3.5 Early child mortality in the first and subsequent generations.

3.6 Thyroid gland condition in the mother and infant.

3.7 Mental and physical development of the child after birth.

4. THE ROLE OF SOCIAL AND PSYCHOSOCIAL FACTORS IN THE HEALTH OF THE POPULATION

4.1 The role of acute and chronic stress in the occurrence of psychological and functional disorders.

4.2 Adverse effects from countermeasures (such as imposed restrictions and relocation) and perceived loss of personal control.

4.3 The role of social support and different styles of coping for the prevention and amelioration of psychological disorders among different groups of the population facing restrictions imposed by a radiation accident.

4.4 The implementation and functioning of mental health services targeted to the accident victims.

4.5 The psychological consequences of the restart of a nuclear reactor among the plant workers and the populations affected in the aftermath of an accident.

5. DEMOGRAPHIC STUDIES

5.1 Study of the impact of a major radiation accident on demographic dynamics.

5.2 Investigation of dynamic models for the birthrate, mortality and expectancy of the remaining life among various groups exposed to radiation and non-radiation factors following the Chernobyl accident.

5.3 Development of a system of actions for the optimization of the demographic makeup in the areas contaminated with radionuclides.

6. DATABASE MANAGEMENT

- 6.1 Elaboration and standardization of primary medical and dosimetric documentation for the registry, suitable for computing purposes (quality control, uniform protocols, record linkage etc.).
- 6.2 Development of a computing environment based on a network of workstations, which should make use of standard hardware and well-supported commercial database management and statistical software.
- 6.3 Development of software packages for computerized control and correction of primary data; optimization of the data base structure (registry); development of an information system providing data on unformatted requests.
- 6.4 Development of an applied software package for the multifactorial analysis of individual and pooled registry data designed for epidemiological studies.
- 6.5 Development of PC software for the express-analysis of pooled register data and for presentation of the output as tables, graphs and maps.
- 6.6 Optimization of the register hardware complex, including the compatibility of computers of various capacity.
- 6.7 Development of telecommunication facilities to provide data exchange through international communication channels.
- 6.8 Accumulation of internationally compatible radiation health data.

7. BIOLOGICAL DOSIMETRY AND INDICATORS

- 7.1 Detection of prompt and late effects on germ cells and ontogenesis in man, animals and their progeny at doses attributed to the accident.
 - 7.1.1 Assessment of the impact of occupational and unplanned radiation exposure on parental gonads, the human foetus and progeny.
- 7.2 Searching for and testing of biological indicators and biological dosimetry techniques for different degrees of radiation injury of the human body at early and late stages after radiation exposure.
 - 7.2.1 Elaboration of mathematical methods, models and software algorithms for the best estimate of absorbed doses in man using different cytogenetic indices.
- 7.3 Cytogenetic investigation of the population living in contaminated areas, and workers who took part in recovery operations of the Chernobyl accident.

8. RADIOBIOLOGY

- 8.1 Study of carcinogenesis and other late effects of radiation exposure as well as means for their prevention and treatment.
 - 8.1.1 Study of molecular, cellular and systemic mechanisms of radiation carcinogenesis in vitro and in vivo; the role of oncogenes, genetic instability, viruses, damage to stem cells and immunodepression.
 - 8.1.2 Mechanisms of late radiation pathology not associated with carcinogenesis (injury of vessels and organ parenchyma, shortening of life expectancy, etc.).
 - 8.1.3 Methods and means for the prevention and treatment of radiation injuries leading to the development of tumors and late somatic disorders such as the use of antioxidants, vitamins, immunomodifiers, microwaves and laser radiation.

8.2 Effects of combined exposure to radiation and non-radiation factors; development of methods for their assessment and ecological monitoring.

8.2.1 Study of the damaging effect of radiation in combination with other anthropogenic factors on the population health and environment, at molecular, genetic, cellular and somatic levels.

8.2.2 Prediction of risk levels and the efficacy of measures taken for protection of the population and prevention of diseases at various levels of environmental contamination with radiation and non-radiation agents.

8.3 Study of early and late changes of the immunological and haematological status in man and animals at different levels of radiation exposure as well as in combination with non-radiation factors.

8.3.1 Study of early and late effects on the immunity, haematopoiesis and homeostasis under combined exposure to radiation, stress and chemical environmental factors.

8.3.2 Immunological monitoring of population groups at risk in contaminated areas.

8.3.3 Methods for the determination of sensitizing properties of non-radiation factors, anthropogenic and natural, in human blood cells; identification of individual sensitivity.

8.3.4 Effects of pre-existing pathology on the development of disorders in the immune system and homeostasis under combined exposure to radiation and non-radiation factors.

8.3.5 Prediction of secondary immunodeficiency and auto-immune disorders in haematopoiesis and homeostasis under combined exposure to radiation and non-radiation factors; rationale for preventive measures.

8.4 Pathomorphological studies of effects of external and internal irradiation in man and animals, including studies on "hot particles".

8.4.1 Morphological investigation of changes in organs and tissues following different radiation exposure modalities; techniques of histochemistry, immunohistochemistry, autoradiography and electronic microscopy.

8.5 Study of structural and functional organization of endocrine cells producing regulatory peptides with the purpose of elucidating mechanisms of pathogenesis for various disorders, predicting their course and developing approaches to their treatment and prevention.

8.5.1 Investigation of the processes of synthesis, secretion, deposition and utilization of melatonin in order to determine the feasibility of predicting the carcinogenic action of radiation.

8.6 Immediate effects of low level irradiation in the gonads of animals at different stages of spermat- and oogenesis; the possibility of correction of radiation-induced disorders.

8.6.1 Effects of low level irradiation on the reproductive function, pregnancy course and development of the foetus in animals; relationship between antenatal radiation exposure and postnatal ontogenesis in a number of generations.

8.7 Mechanisms of destabilization of the genome in man and animals at different levels of radiation exposure.

8.7.1 Damage to the DNA structure and the cell repair systems in man and animals at a long time after acute radiation injury and under chronic low-dose rate radiation exposure.

8.7.2 Study of somatic mutations in eukaryotic cells, including those in man at a long time after acute radiation injury and under chronic low-dose rate radiation exposure.

9. RADIATION DOSIMETRY

9.1 Patterns of individual and collective radiation dose build-up in different groups and categories of people due to radiation exposure as a result of the Chernobyl accident.

9.2 International intercomparison; harmonization of instrumental and computational methods of the dosimetry of external and internal irradiation; verification of radiation doses.

9.3 Development and elaboration of large-scale systems for collection, verification, processing and analysis of dosimetric and radioecological information; maintenance of the dosimetric and radioecological data base.

9.4 Dosimetric support of epidemiological, clinical and radiobiological studies of the Centre.

9.5 Reconstruction of doses and verification of dosimetric information for the registry from collaborative field studies data, results of clinical examination of patients and the radioecological data base.

10. EDUCATION AND TRAINING

10.1 Formal education of participating staff in epidemiology, statistical methods, interviewing protocols, etc.

10.2 Basic educational programme for doctors and paramedical personnel in affected communities (by development of short courses, printed materials, video tapes, films etc.) to provide background in radiation effects.

10.3 Public information material.

10.4 Short specialist courses for physicians in the medical aspects of accidents involving ionizing radiation.

IV. EXPECTED OUTCOME OF THE PROGRAMME

1. HEALTH OF THE POPULATION

1.1 Assessment of the health status and relative significance of etiologic factors in different groups of population.

1.2 Assessment of spacial and temporal patterns of radiation dose distribution in different groups of population under large-scale radioactive contamination.

1.3 Improved understanding of the role of radiation and other factors in the onset and development of thyroid malignancies and other pathological states; advancement in prevention, diagnosis and treatment.

- 1.4 Improved understanding of the role of psychological factors in human behaviour and in the development of psychosomatic disorders.
- 1.5 Elaboration of a set of measures for restoring the health and reducing hazards among the population and recovery workers exposed to radiation.
- 1.5 Elaboration of the concept of welfare for the population in the contaminated areas.
2. USE OF THE CHERNOBYL EXPERIENCE
 - 2.1 Specification of decision-making criteria in the case of large-scale accidents based on the Chernobyl experience.
 - 2.2 Establishment of an International Bank for Selected Radiation Health Data.
 - 2.3 Optimization of epidemiological methods for the assessment of consequences of large-scale radiation accidents.
 - 2.4 Consolidation of experience and criteria in assessing the health status, radiation exposure and working conditions during recovery operations.
 - 2.5 Optimization of devices, measurements, models and computations for external and internal dose assessment.
3. SCIENTIFIC RESEARCH
 - 3.1 New and improved methods to decrease radiation dose using various approaches (social, ecological, dietary, pharmacological, etc.).
 - 3.2 Feasibility to prevent the possible development of malignant tumours, genetic abnormalities and other late effects caused by radiation.
 - 3.3 Revision of radiation risk estimates for carcinogenic, teratogenic and genetic effects.
 - 3.4 Contribution to knowledge on various effects of low-level radiation and its interaction with other environmental agents.

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