WHO/EHG/95 02
English only

# FIFTH COORDINATION MEETING OF WHO COLLABORATING CENTRES IN RADIATION EMERGENCY MEDICAL PREPAREDNESS AND ASSISTANCE, (REMPAN)

**Paris, France , 5-8 December 1994**

## Contents

**Page**

**Dr W. Kreisel's opening address** ..... **2**

**The Speech of Dr Jack Sinnaeve** ..... **4**

**Summary Report** ..... **6**

**Annex I** **Programme** ..... **12**

**Annex II** **List of participants and observers** ..... **17**

**Annex III** **WHO Collaborating Centres for radiation emergency medical preparedness and assistance** ..... **25**

**Annex IV** **WHO Plan for Radiation Emergency Medical Assistance** ..... **112**

**Annex V** **Some individual contribution of participants** ..... **128**

This document is not issued to the general public, and all rights are reserved by the World Health Organization (WHO). The document may not be reviewed, abstracted, quoted, reproduced or translated, in part or in whole, without the prior written permission of WHO No part of this document may be stored in a retrieval system or transmitted in any form or by any means - electronic, mechanical or other without the prior written permission of WHO.

The views expressed in documents by named authors are solely the responsibility of those authors.

Ce document n'est pas destiné à être distribué au grand public et tous les droits y afférents sont réservés par l'Organisation mondiale de la Santé (OMS). Il ne peut être commenté, résumé, cité, reproduit ou traduit, partiellement ou en totalité, sans une autorisation préalable écrite de l'OMS Aucune partie ne doit être chargée dans un système de recherche documentaire ou diffusée sous quelque forme ou par quelque moyen que ce soit - électronique, mécanique, ou autre - sans une autorisation préalable écrite de l'OMS.

Les opinions exprimées dans les documents par des auteurs cités nommément n'engagent que lesdits auteurs.

**Opening address to the Participants of the 5th Coordination Meeting of WHO Collaborating Centres in Radiation Emergency Medical Preparedness and Assistance Network (REMPAN)**

**Dr W. Kreisel, Executive Director**
**Health and Environment, World Health Organization**

Ladies and Gentlemen,

It is a great honour for me on behalf of the Director-General of WHO to open this 5th Coordination Meeting of WHO Collaborating Centres in Radiation Emergency Medical Preparedness and Assistance Network (REMPAN).

First of all, I should like to express my gratitude to Dr Burg, the President of the Institute Curie and Dr Camilleri, its Medical Director, for providing the possibility to organize this meeting in one of the famous institutes in the field of treatment of radiation victims and medical application of radiation. The assistance of local organizers of the meeting and Professor Jammet, the Chairman of the ICR (International centre of Radiopathology) personally is also very much appreciated. It is thanks to Dr Jammet's commitment and enthusiasm that we have got together for this meeting in this extraordinary city

Our meeting is being held at the Institute named after Curie. One cannot help admiring the two great matrimonial couples of two generations of the same family - Pierre and Marie Curie, and Irene Curie and Frederick Jolio-Curie, for their brilliant contribution to the scientific knowledge of radioactivity. Five Nobel prizes for four members of the same family is a unique example in the history of all times and peoples.

Pierre Curie in his Nobel prize Award lecture presented in 1905 had emphasized that great discoveries could provide invaluable blessings to humanity and at the same time they could bring suffering and sorrow to people. Unfortunately, the discovery of radioactivities marked by both these features Parallel to our knowledge of the useful application of radioactive material in different fields of human activity, we know about the harmful health effects of radiation on human beings. New data related to this subject have recently been provided by scientists who have been studying the medical consequences of the Chernobyl accident within the WHO International Programme known as IPHECA. At present, there is no doubt that the incidence of thyroid cancer has increased dramatically in children residing in radiocontaminated territories. before the accident, the annual incidence rate observed in Belarus, Ukraine and Russian Federation were in line with spontaneous rates in many other parts of the world and ranged between 0.3-1.0 per million After the accident, 307 thyroid cancers have already been identified in 3 million children in Belarus. It means that this incidence rate of the disease has increased about 100 times over the background rate. The same trends have been noted in the radiocontaminated regions of Ukraine and Russian Federation.

The health of the Chernobyl accident recovery workers is also of great concern to the health authorities in the three affected States. Preliminary results have shown the increase of incidence rates of somatic and mental disorders as well as disability in this group of the population. WHO has established a new project within IPHECA related to medical assistance for the Chernobyl accident recovery workers All aspects of medical consequences of the Chernobyl and other major radiological

disasters are planned for discussion at the WHO International Conference to be held in Geneva in November next year.

Based on the collected data of harmful health effects of radiation, WHO has been developing specific programmes related to medical preparedness of radiation accidents, radiation protection, environmental radiation monitoring and evaluation and minimization of the health effects of radiological disasters. In May 1988, the World Health Assembly took a decision to accede to the Assistance Convention The WHO plan for radiation emergency medical assistance is reflected in the Emergency Notification and Assistance Technical Operations Manual (ENATOM) developed by IAEA as a guide for State parties to the Convention. Hence, WHO can be regarded as one of those international organizations which may be directly called upon for assistance under the provision of the Convention.

The Chernobyl accident gave a strong new impulse for further development of WHO activities in the field of radiation emergency medical preparedness. As a result of this activity, the network of WHO Collaborating Centres - REMPAN - has been established. This network is the main instrument of the WHO plan for radiation emergency medical assistance in case of a nuclear accident or other radiation emergency. But there is no base to consider that the process of creating a reliable system for radiation emergency medical preparedness has been completed. Needless to say that WHO will continue its activity in this field. The necessity to follow this direction is dictated by the spreading of the peaceful use of radiation, by the growing number of local military conflicts and terrorist act. Suffice to say that at present total number of nuclear power reactors in the world is 430,55 reactors are under construction, and a huge quantity of radioactive waste has been collected in nuclear enterprises. And this is only a part of the potential threat of radiological disasters.

A keen interest in this WHO meeting displayed by other International governmental and non-governmental organizations, scientists and specialists, confirm that the WHO concern related to the development of an effective international system on radiation emergency medical preparedness is shared and widely supported. I am pleased to note that among the participants at our meeting there are directors of WHO Collaborating Centres from six WHO regions, representatives of IAEA, EC, Hiroshima International Council for Health care of the radiation-exposed, scientist from China, India, Russian Federation, Germany, USA and France.

The programme of our meeting included very important aspects related to the present state and future promotion of activities within REMPAN. During these four days you will discuss many actual scientific problems dealing with early diagnosis and treatment of radiation injuries, improvement of training, collection and exchange of information, and new approaches in the organization of REMPAN. I do hope that based on the results of these discussions, the appropriate recommendations would be developed in order to strengthen the capability of the international system for medical preparedness to radiological disasters.

I wish you every success in your work and pleasant days in Paris.

*****

**Opening Session - The Speech of Dr Jack Sinnaeve**
**for the 5th Coordination Meeting of WHO Collaborating Centres in Radiation Emergency Medical Preparedness and Assistance Network (REMPAN), Paris 5-8 December 1994**

Ladies and Gentlemen,
Dear Colleagues,

It is my pleasure to be here today with you and to present the activities of the EC in this very important field. I thank Professor Henri Jammet for having given me this occasion.

The Radiation Protection Research Action has supported studies on "Radiation Accidents" for many years through a multidisciplinary approach: Risk Assessment and Management, Dosimetry and Radiobiology. All these studies have given valuable information for the management of accidentally irradiated people.

For the assessment and management of post-accidental situations sector I will outline two major multipartner projects: data base and decision aiding techniques. The Eurogrid database project has as objectives to collect and organize data allowing the assessment of individual and collective doses, and of economical aspects of an accidental release of radionuclides at the European scale. This is a continuing task, new data being introduced in the base and old ones being updated. Concerning the decision aiding techniques, 18 European institutes deal with the development of an integrated and comprehensive real-time-on-line decision support system (RODOS) for nuclear emergencies in Europe. These decisions include early emergency actions in the near field, such as sheltering, evacuation and distribution of stable iodine tablets and later phases after the accident such as relocation, decontamination or food-bans. This system needs to be comprehensive, which integrates models and data for assessing, presenting and evaluating the accident consequences in the near, intermediate and far distance ranges. Such a system is foreseen to be used also as an education and a training tool in preparing and exercising emergency plans Research on this system is continuing and further development of the hardware and software are needed Since the reactor accident in 1986 in Chernobyl, CIS institutes have also became part of the RODOS project. In parallel other decision support systems are being developed.

Dosimetry of course has been one of the major components of our programme. After the Chernobyl accident it became urgent and necessary to develop techniques of biological and physical dosimetry and to reconstruct doses. The work on biological dosimetry is coming to an end, but more research is needed for physical dosimetry.

Diagnosis and treatment of radiation victims has been part of the Radiobiology sector from the early years of the programme, under the heading "non-stochastic effects" of radiation, later to be called "deterministic effects". It included radiation syndromes and their treatment after exposure of large parts of the body and after local exposure to skin and subcutaneous tissues and radiation damage to lens, thyroid and other tissues of relevance in radiation protection. As years passed the aims and objectives in this field became more concrete, defining better the needs. Following the Chernobyl accident, much more emphasis is given to this area of research.

Concretely the aims are directed at:

1. Evaluation of patients treated for acute radiation sickness after the Chernobyl accident,
2. The hemopoietic system, which belongs to the most radiation sensitive systemic organs,
3. The skin, which is frequently affected since acute localized irradiation and external contamination are the most frequent radiation accident events.

The Chernobyl accident offers substantial study material on high dose accident victims in the range of 1 to > 8 Gy exposures. Of 138 patients suffering from confirmed acute radiation sickness, 103 survived and were/are in the process of rehabilitation. This wealth of patient material is being used for an in depth investigation on the treatment of acute as well as late radiation damage, involving not only the immuno-hemopoietic system and the skin, but also the gastrointestinal tract, the kidney, the liver, the central nervous system and endocrine functions This part of the project aims to establish dose-effect relationships for various types of human organ damage. It is imperative that dosimetry be supplemented by up-to-date methodology and reanalysis.

For acute radiation damage to the immuno-haemopoietic system, it is essential as quickly as possible in the initial phase after exposure to distinguish patients with sufficient residual hemopoietic recovery to survive with conventional supportive care and those which require intensive, sophisticated treatment in specialised centres, which may include treatment with haemopoietic growth factors.
The management of acute localised skin irradiation in patients after accidental exposure remains difficult to perform. Needs for earlier and more accurate diagnostic methods do exist but strategies for treatment are being developed. Of particular concern is the prevention of fibrosis.

In 1995 we will start the 4th Framework Programme. We are now preparing the Workplan and identifying priority areas. The new title of the programme is "Radiological Impact on Man and the Environment". The Plan of Research Work includes: Understanding the mechanisms of radiation action; Evaluation of radiation risks; and Reduction of exposure levels. Another chapter of the programme is "Historical Liabilities". This part will deal with, on the one hand, the consequences of the Chernobyl accident on the environment and on health, and on the other hand it will deal with other contaminated areas of the former Soviet Union, i e. the Urals (Chelyabinsk, Mayak) and Kazakhstan.

In these sectors emphasis is put on and importance is given to the diagnosis and treatment of accident victims, to the preparedness in case of accident and to the development and amelioration of decision systems after an accident. The diagnosis and treatment of accident victims will include research on growth factors for the haemopoietic system and the skin.

Last but not least, one of the originalities of our programme is **ERPET**, the **E**uropean **R**adiation **P**rotection **E**ducation and **T**raining programme. It aims at harmonising education and training in radiation protection by the organisation of courses on key problems in radiation protection. Last year a course on diagnosis and treatment of accident victims took place in Europe for the first time. The only course that exists on this topic is in Oak Ridge, USA. When thinking of radiation accident victims one must not only think of nuclear reactor accidents, but also of small accidents that occur more frequently such as burns or inhalations, etc to workers. This first course lasted 5 days. There were 23 students from 13 different countries attending the course. They were mostly medical doctors working in radiation protection, occupational medicine, nuclear medicine. It became clear after this course that the need for well defined protocols and guidelines is evident. The questions to be answered *inter alia* are: how to recognize reversible, irreversible damage to the stem-cell compartment and to determine the limits of the use of haemopoietic growth factors to stimulate haemopoiesis; development of a quantitative model to predict the outcome as the basis for the therapeutic measures; to answer the question as to what type of therapeutic intervention should be done and whether the stem cell transplantation may be necessary etc. Another course on this subject will take place around mid-1996.

I tried to cover in these 20 minutes a big part of our programme. I think a whole day would have been necessary if I was to give more details. I wish you a fruitful and an interesting week.

*****

# SUMMARY REPORT

## 1. Introduction

WHO has developed a network of Collaborating Centres for Radiation Emergency Preparedness and Assistance (REMPAN).

The primary purpose of this network is to promote amongst Member States medical preparedness for radiation accidents and to provide advice and medical assistance in case of a radiation accident, in particular under the International Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

The second task of the network is the study of long-term biological effects of such accidents.

The network started with three centres in France, Russia and the USA and increased by Collaborating Centres from Argentina, Australia, Brazil, Germany and Japan to provide a broader worldwide emergency coverage. In this way REMPAN facilitates a coordinated response in radiation emergency involving more than one assisting Centre

The Fifth meeting was held in Paris (France) from 5 to 8 December 1994. The agenda of this fifth meeting and the list of participants are given in Annex I and II respectively.

## 2. Description of the meeting

### 2.1 The main objectives

The main objectives of the meeting were to:

- overview the current state of the REMPAN and discuss its future development;
- discuss the updated approaches for diagnosis, treatment and follow-up of irradiated patients;
- overview of the database and registries for irradiated persons;
- review the different scenarios of radiological and nuclear accidents;
- discuss advanced approaches in radiation medicine;
- approve the WHO plan for radiation emergency medical preparedness and assistance.

### 2.2 Course of the meeting

The meeting was opened by Dr W. Kreisel, Executive Director and participants were welcomed by Dr C. Burg, the President of the Institute Curie, Dr J.P. Camilleri, the Medical Director of the Institute Curie and Dr H.P. Jammet, the Chairman of the ICR (International Centre of Radiopathology).

Drs E. Amaral, Th. Fliedner, E. Komarov, R. Ricks, G. Souchkevitch and N. Wald were selected co-Chairmen and Drs C. Mason, A Oliviera and J. Skvarca were appointed Rapporteurs of different sessions of the meeting.

Dr G Souchkevitch overviewed the WHO REMPAN Programme. Drs J Sinnaeve and H. Eriskat outlined the Radiation Accident Programme in European Union.

The Directors of the WHO Collaborating Centres provided updated information about main activities of their Centres (Annex 3). Complementaries and deficiencies of the various activities were discussed and rational approaches were suggested in order to improve desired cooperation between the Collaborating Centres.

It was noted that WHO responsibilities for notification and assistance convention in case of nuclear accident or any radiation emergency were covered mostly in all topics by WHO Collaborating Centres. Each Centre should provide additional programme capabilities as desired.

Positive advances were found in the diagnostic and therapeutic (treatment) actions, as well as in plans for medical preparedness and assistance. Also general and specialized educational activities were covered at local, regional and international levels.

As the result of the overview of the REMPAN through WHO Collaborating Centres the following main needs were stated and enforced:

i. More consistent rapid communication links between all WHO Collaborating Centres, establishment of world-wide database, QA programmes, standardization of data and procedures, as well as clear and simple guidelines for each situation.

ii. Formal invitation of other Institutions, Organizations, and countries responsible for different radiation programmes, to participate as liaison institutions through WHO Collaborating Centres in REMPAN; example: Peru and Paraguay as liaison institution through Argentina

iii. More and dedicated practical training for medical doctors-physicians who are involved in diagnosis and treatment with the assistance of experienced in field faculty (example: Training Course, held in Brazil, 1981 (Centrecom).

iv. Additional research findings with new procedures and technologies, new epidemiological studies, new drugs, etc. (example: MRI, etc.).

v. Better international cooperation, specially with organizations which are developing the same or similar programmes as European Community and IAEA.

vi. Seek additional-funding support from other sources such as national atomic energy or nuclear facilities as well as health institutions to support and expend WHO REMPAN capabilities in research, training and emergency response.

## 3. Scientific sessions

The Scientific session reviewed the different scenarios of radiological and nuclear accidents. Owing to the stringent safety measures adopted in nuclear installations, nuclear accidents became rare. On the other side, with the dissemination of the industrial and medical uses of radiation, the likelihood of a radiological accident to occur has considerably increased, especially if it is considered the existence of the so-called migrant sources and their possible misuse for terrorism action and illegal purposes. A recent accident in Kiisa, Estonia has clearly demonstrated the importance of the medical consequences for the public in such a type of accident.

A review was made on the available physical dosimetry methods and the need for their further development. ESR of ceramic material and body specimens - teeth and bone -, seems to be a promising technique of estimating whole body irradiation. Biological dosimetry based on cytogenetics is a reliable but time-consuming method for exposure estimation. It was emphasized that REMPAN should promote further research in this field stimulating the development of automated methods such as FISH.

Biological indicators of radiation damage are available at molecular levels, being the immune system a critical parameter; at cellular level, such as indicated by the yield of chromosome aberrations in cases of overexposure to ionizing radiation; and at tissue level, demonstrated by changes in subsets populations of lymphocytes and abnormal response of stem cells in culture. Needless to say that more research is required to establish the role played by these markers. REMPAN was asked to collect more data in order to set up which biological indicators are of relevance for biomedical evaluation of exposed persons.

Regarding cutaneous radiation syndrome there is a continuous need for better evaluation of underlying injuries involving connective tissue and vascular endothelium. MRI, thermography and skin biopsies were helpful diagnosis and prognosis tools in several accidental experiences, but it is clear that further research should be conjointly developed by the Collaborating Centres, under WHO auspices, to study techniques that could evaluate cutaneous and other related tissues problems arising from penetrating irradiation.

Use of haematopoietic growth factors to accelerate marrow recovery after high doses of radiation is now widely accepted Recent accidents (Goiania, San Salvador, Soreq and Nesvidge) confirmed preclinical studies that demonstrated their dramatic role in the differentiation and proliferation of progenitor cells thus leading to an increase number of circulating cells. Early administration of growth factors when associated with efficient infectious complications control is able to reduce significantly the mortality. In this regard growth factors act as radioprotectors. Attention should, however be paid to the influence of growth factors in releasing toxic cytokines and in the potential for malignant transformation. Some countries have developed methods where stem cells deriving from cord blood (France) or fetal liver cells (China) were successfully transplanted Nevertheless, these methods should be restricted to cases where complete marrow suppression is foreseen.

Medium and long-term follow-up of radiation accident victims must take into account the development of radiation-induced sequelae. Experience gained in radiotherapy could be applied to the radiopathology of radiation accident cases. Approximately 10% of cases under medical surveillance in the International Centre for Radiopathology (ICR), France, are constituted of patients who developed fibrosis and other late cutaneous disorders after the radiotherapy. REMPAN should consider this experience when developing their medical preparedness programmes.

Late stochastic effects are expected after external or internal irradiation . Thyroid abnormalities including cancer were studied in recent years especially in high background radiation areas and regions affected by environmental radioactive contamination. Owing to the poor quality of collected data, absence of reliable control population and lack of statistical power it was not possible to draw any formal conclusion from the epidemiological studies aiming at associate radiation exposure and thyroid abnormalities. Confounding factors such as low iodine intake, vitamin deficiency and depressed oligoelements in soil represent an important drawback in this type of study. REMPAN should be acquainted with the studies performed in Belarus, Russian Federation and Ukraine, where a high incidence of thyroid tumours, especially in children, was detected in areas affected by the Chernobyl accident

Training of personnel and continuous education of the public should be part of REMPAN strategy to improve the quality of medical response during an emergency and reduce the psychosocial distress caused by radiation accidents. WHO was asked to promote periodically (annually) international training courses for medical doctors and other professionals involved in emergency preparedness. A number of suggestions were made to WHO to fulfill the need for medical publications orienting medical practitioners on how to handle radiation accident victims. Although IAEA has not the immediate task to train or educate physicians, its participation in such a kind of programme is strongly recommended

It was stressed that during the triage all means available should be used for early diagnosis of radiation-induced injuries Clinical history (onset of symptoms), physical examination (intensity of early erythema) and laboratory findings (lymphocyte decline) are easily documented by medical doctors if they are conveniently trained.

WHO had acceded to the Convention on Early Notification of a Nuclear Accident and to the Convention on Assistance in the Case of a Nuclear Accident or a Radiological Emergency. To fulfill its commitments in accordance with the Assistance Convention and for an adequate response to any request, WHO should count on an efficient round-the-clock communication system and facilities for information processing. It should have the capacity to provide a survey team for rapid evaluation of the situation on-site and to perform external radiation monitoring and/or contamination surveys with appropriate equipment. Additionally, still in accordance with the Assistance Convention, developing and structuring of REMPAN organization is required, as well as organization of international training courses and establishment of appropriate database on radiation accidents and radiation accident victims. It was emphasized that WHO should develop guidelines for on-site medical intervention, medical management in hospital facilities and medical and hospital preparedness. It was noted that coordination and cooperation - WHO and WHO Collaborating Centres, and WHO and IAEA, would be required for planning and managing radiation accident cases.

## 4. WHO Plan for REMPAN

The WHO Plan for Radiation Emergency Medical Preparedness and Assistance was reviewed and following minor amendments, adopted (Annex IV).

## 5. Scientific reports on current research developed by WHO Collaborating Centre

Reports on research into radiation accident preparedness were presented by contributing institutions: E. Baranov (Moscow) and Th. Fliedner (Ulm, Germany) - international computerized database for radiation victims; V. Bebeshko (Kiev) - computer database on clinical observation (after the Chernobyl accident); R. Ricks (Oak-Ridge, USA)-USA registries: REACTS, NRC; Y. Hasegawa (Hiroshima, Japan) - Hiroshima - Nagasaki epidemiological studies; T. Makio (Hiroshima, Japan) - activities of HICARE; G.Y. Ye (Beijing, China) - database and consulting system for medical management, A. Lauger and J. Reiffers (Paris, France) - registry of radiological clinical data for patient after TBI; J.M. Cosset (Paris, France) - collection of patients in radiopathology; Th. Fliedner and D. Densow (Ulm, Germany) - general therapeutic indicators; G. Wagemaker (Rotterdam, The Netherlands) haemopoetic growth factors; T.J. Mac Vittie (Bethesda, USA) - cytokines; E. Gluckman (Paris, France) - cell therapy for radiation induced aplasia; E. Carosella (Paris, France) - immunological aspects in skin after BMT; P Gourmelon (Paris, France) - characteristics of gastro-intestinal syndrome; J M. Cosset and B. Durbrag (Paris, France) - pulmonary syndrome; A. Guskova and A. Barabanova (Moscow, Russian Federation) - radiation burns.

Dr G. K. Iyer (Bombay presented information about the Indian experience in the treatment of a patient suffering from radiation injuries Dr I. Turai (Vienna, IAEA) reported preliminary conclusions about the medical consequences of the radiation accident at Kiisa, Estonia (October-November 1994).

## 6. The output of the meeting

6.1 The meeting made a significant contribution to the coordination of the activities and plans of the WHO Collaborating Centres in Argentina, Australia, Brazil, France, Germany, Japan, Russia and the USA.

6.2 Revised documents were prepared updating the activities of the Collaborating Centres (Annex III). Responsibilities of the Centres and the avenues through which their assistance can be obtained were reviewed and updated.

6.3 A document was reviewed, amended and adopted (Annex IV) describing the WHO Plan for Radiation Emergency Medical Assistance.

6.4 Participants were brought up to date on the activities and research work of a number of laboratories and agencies around the world and, in particular, on the work being carried out by the Institute Curie in Paris.

6.5 Current approaches for diagnosis and treatment of haematological syndrome, gastro-intestinal syndrome, lung syndrome, and radiation burns were reviewed and recommendations for future research in these fields were provided. It was noted that introduction in radiation medicine of the growth factors, cytokines, haematopoietic stem cells and new techniques for separation of stem cells provided the possibility to treat successfully the haematopoietic form of the acute radiation syndrome.

6.6 The meeting provided recommendations on how to improve organizational structure of the REMPAN, emphasized on the necessity to develop international guidelines, data base and training activity, promote communication capabilities within REMPAN, introduce standardization and quality assurance in research programmes. Financial aspects of the REMPAN were discussed and recommendations on mobilizing of extrabudgetary resources were given.

## 7. Plan of coordinated actions of WHO Collaborating Centres for 1994-1995

7.1 To disseminate information, advice, emergency planning and training materials to relevant institutions in nearby countries.

7.2 To facilitate exchange of staff between Collaborating Centres, taking advantage of existing government to government scientific exchange programmes.

7.3 To provide details on current contingency plans and reports on cases of overexposure and their management.

7.4 To disseminate to relevant institutions in their regions, information on the development and progress of the international WHO programme.

7.5 To pursue with relevant institutions in their regions the collation of radiation accident information and, in particular, to facilitate the development of the international radiation accident clinical data base managed by the Ulm Collaborating Centre for acute radiation syndrome.

## 8. Recommendations to WHO

8.1 WHO should take prime responsibility for international activities relating to the medical aspects of radiation accidents.

8.2 WHO should be responsible through its Collaborating Centres for the preparation of international reports on this topic.

8.3 The REMPAN should be further developed through involvement of national liaison institutions supporting REMPAN.

8.4 WHO should continue efforts on resource mobilization for the development of REMPAN activities.

8.5 WHO should advise Collaborating Centres and their liaison institutions in establishing legal and ethical protocols for the incorporation of patients data into radiation accident databases and for international access to such databases.

8.6 The sixth coordination meeting should be convened tentatively in Hiroshima, Japan in October 1995.

## 9. Acknowledgements

The participants would like to acknowledge the generous hospitality and support of the Institute Curie, Paris and express their gratitude to Dr Jammet, Director of WHO Collaborating Centre on Radiopathology for his assistance

The participants would also like to acknowledge the support of the World Health Organization in convening the meeting. The group appreciated the dedicated work of the Chairmen and Rapporteurs.

The group thanks Dr G. Souchkevitch for his very important contribution to the organization of the 5th REMPAN Meeting.