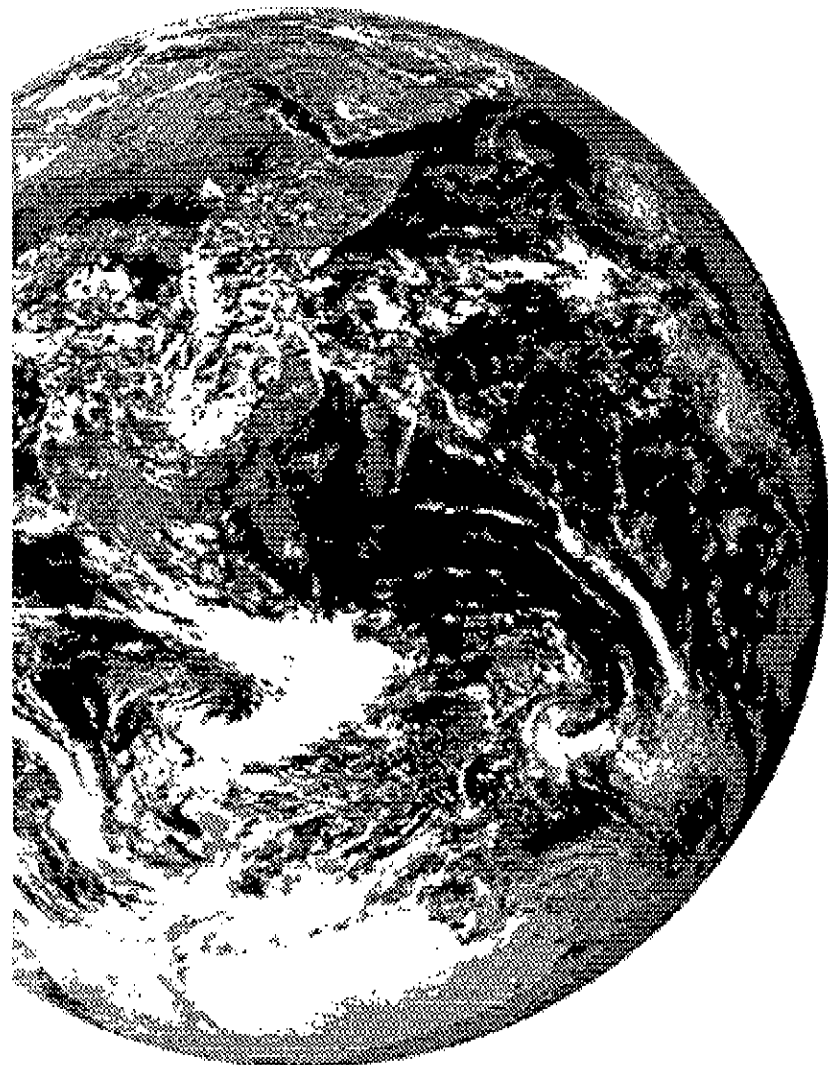


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# Prevention of Radiation Health Hazards: a WHO Collaborative Programme



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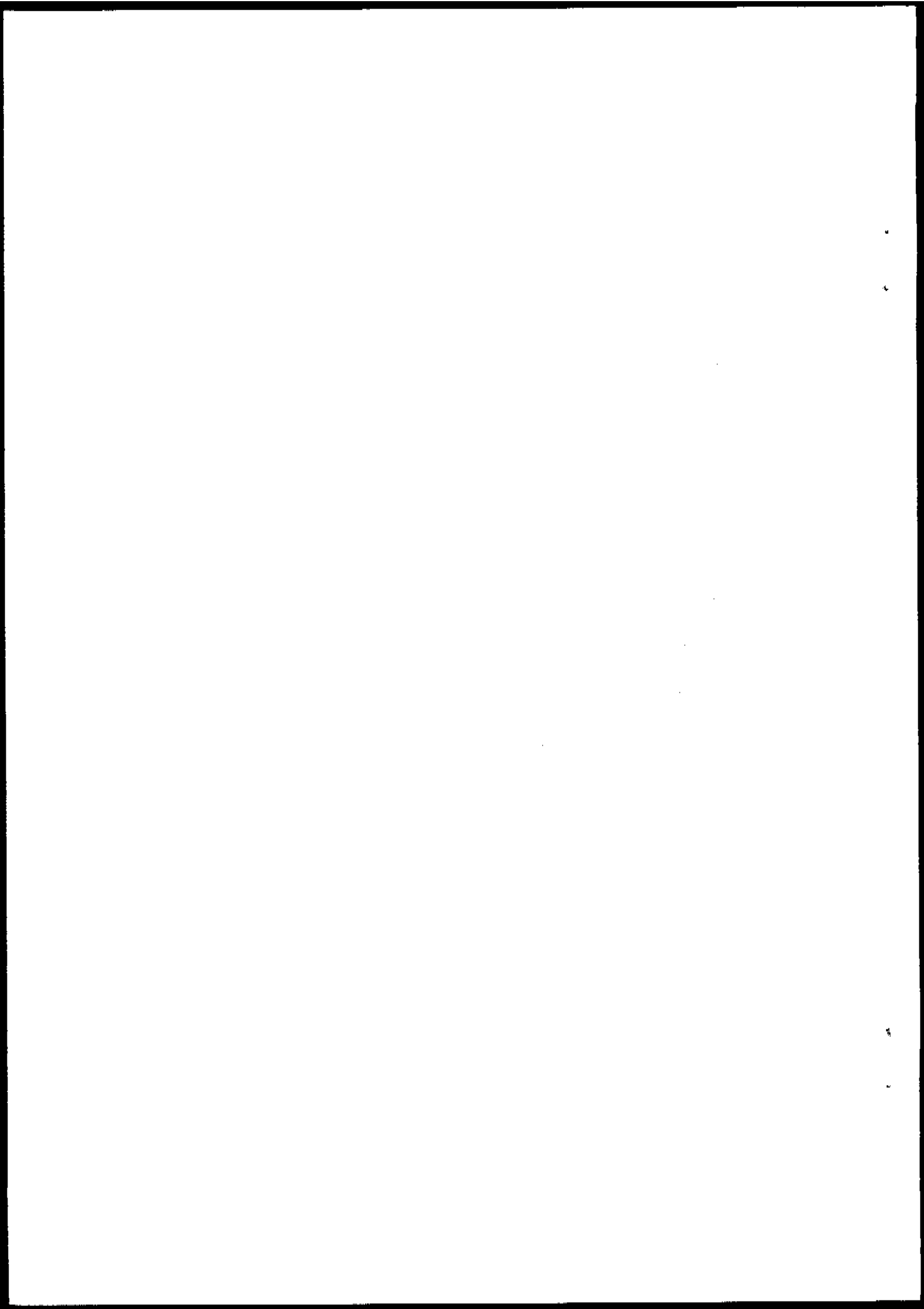
### **World Health Organization 1997**

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## Preface

This document describes a collaborative programme initiative on prevention of radiation health hazards between WHO headquarters, the regional offices and collaborating centres, and the International Agency for Research on Cancer (IARC).

The objective of WHO is the attainment of the best possible level of health by all people. WHO has two main constitutional functions: to act as the directing and co-ordinating authority on international health work; and to encourage technical co-operation on health with Member States.

Health is defined as the state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. Exposure to radiation, both in the environment and workplace, can cause a variety of health effects that can impact on the physical, mental and social well-being of people. Strong public concern and clear

public health risks dictate the need for a prominent WHO involvement in the field and the need for cooperation among the specialists that exist in the different agencies.

Radiations encompass both ionizing (IR) and non-ionizing (NIR) forms. IRs are those radiations having sufficient energy to break macromolecular bonds and cause damage to tissues and organs by the formation of charged particles (ions). The health consequences of exposure to IR include both immediate effects from acute, high doses of radiation such as burns, radiation sickness, and delayed or long-term effects such as a higher possibility of cancer. Radiation accidents may also cause major impacts on mental health and social well-being due to stress, anxiety and forced relocation.

NIRs on the other hand, include those radiations and fields not having enough energy to cause ionization in tissues, but which can cause adverse health

consequences in other ways. The major NIRs included in the programme are electromagnetic fields (static, low frequency and radiofrequency fields from such sources as power lines and mobile telephones) and ultraviolet (UV) radiations. The main source of UV is the sun, and with stratospheric ozone depletion, it is expected that the higher UV intensities reaching the ground will lead to increases in UV-induced effects such as, skin cancer, eye cataracts, and possible effects on the immune system.

WHO has decided to integrate its expertise in IR and NIR protection. Specialist expertise in radiation protection exists within HQ, the European Centre for Environment and Health (ECEH) of EURO and IARC. The process of integration will be ongoing and responsive to changing needs and scientific developments in the field. Within the Programme there are seven elements, described below, reflecting the evolution of radiation protection projects over

the past few decades. Much of the work will be carried out in collaboration with other interested international agencies and authorities, such as UNEP, IAEA, ILO, WMO, UNSCEAR, ICNIRP and the EU.

### **Scientific assessment**

WHO has a strong tradition of preparing assessments of the health impact of exposure to various physical and chemical agents. Two series of documents are currently published. Under the title Environmental Health Criteria, launched in 1976, WHO/HQ has published a series of reports on chemical and radiation hazards aimed at providing national authorities with an understanding of the health hazards of specific environmental agents. The IARC Monograph Series, which assesses the carcinogenic potential of various exposures, mainly to chemicals, also numbers more than 100 volumes. Volumes in both series have addressed issues related to

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IR and NIR health risk assessment and protection.

WHO has a clear mandate to investigate and prevent detrimental health effects from exposure of people to non-ionizing radiation. Through the International EMF and the INTERSUN Projects assessments are made of the scientific literature and gaps in knowledge identified that need more research in order to make better health risk assessments for both electromagnetic fields and UV.

### **National programme development**

Due to the constant development of new information on health risks from exposure to radiation, all countries need a radiation protection policy and plan for minimizing the health risks. For this to be most effective, international cooperation on the development and sharing of information is highly desirable. Each country needs a focal point or central government agency for

disseminating health protection information. WHO provides assistance with the generation and implementation of national radiation protection plans.

In the field of ionizing radiation WHO will follow the "International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation", jointly sponsored by FAO, IAEA, ILO, NEA (OECD), PAHO and WHO and published by IAEA in 1996.

In some countries, resources may not be available to implement a radiation protection programme. In many cases this assistance is supplied by the IAEA to Ministries of Energy or similar agencies. WHO will not attempt to duplicate this assistance but will, if requested, assist ministries of health, environment or similar agencies, with protection programmes on health for the general public and those occupationally exposed.

Through the International EMF Project, national authorities are

provided information to support their EMF protection programmes. Similarly the INTERSUN Project provides national authorities with guidance on protection from increased exposure to UV as levels of stratospheric ozone decrease. Through its Monograph programme and the research it conducts, IARC provides information to governments and scientists alike on cancer and effects of radiation.

### **Emergency Preparedness and Assistance**

The primary measure for the protection of the public and workers from the health effects of radiation emergencies is to reduce the probability and the possible magnitude of the consequences. This is achieved through good design, engineered safeguards and staff competence, but there is also a continuing need for emergency preparedness.

WHO is a party to the Early

Notification Convention and the Assistance Convention for nuclear accidents or radiological emergencies. The specific role of WHO in the family of UN Organizations is to address aspects directly relevant to the medical community and health authorities in Member States. Medical preparedness for large radiation emergencies includes planning, response and assistance and is covered by a single WHO programme for Radiation Emergency Medical Preparedness and Assistance (REMPAN).

Within REMPAN there are two separate but linked aspects, namely the medical intervention to treat acutely exposed individuals and public health advice to mitigate the long term effects of exposure to low and protracted doses that might accrue to the populations living in exposed regions.

The global network of REMPAN Collaborating Centres with expertise in the treatment of acute radiation injuries is a WHO

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mechanism for advice, training and assistance in medical care, and the centres will also assist in the establishment of medical emergency plans.

In the case of a nuclear accident or radiological emergency affecting any WHO Region, the Regional Offices will respond and assist Member States in alleviating the public health consequences. The European Region, by virtue of its relatively high densities of population and large number of nuclear facilities, presents particularly urgent problems in the area of public health emergency preparedness and response. WHO/EURO already has in place a system of National Health Advisers for Radiation Emergencies in more than 30 countries. The next step planned is to update and further develop guidance on public health aspects in nuclear emergency preparedness and to respond and assist in a radiation emergency affecting the European Region.

WHO/AMRO is also very active

in emergency preparedness and assistance. The programmes include one on Disaster Preparedness and Emergency Relief and another on Radiological Health. Both are actively involved in educational activities regarding emergency preparedness and response. AMRO recently sponsored a consensus seminar in Havana, Cuba, attended by 17 countries, as well as three WHO Collaborating Centres who are part of the REMPAN network. The Radiological Health Programme of AMRO has also provided assistance to national authorities in the region to overcome problems associated with the overexposure of people in radiation accidents.

### **Radiation monitoring**

The principal activity in this area related to ionizing radiation within WHO is GERMON (the Global Environmental Radiation Monitoring Network). This is a collaborative effort between WHO, UNEP and national

institutions in some 60 countries, and it maintains close liaison with IAEA, UNSCEAR and WMO. The network was developed in 1987 as a part of the Global Environmental Monitoring System. The aim of GERMON is to provide information to governments and the scientific community, to facilitate assessments of the impacts of radioactive contamination on public health and the environment.

Within the non-ionizing radiations, increasing UV levels, as the stratospheric ozone levels decrease, are monitored under INTERSUN by some of the WHO collaborating institutions. While the INTERSUN Project is taking measures to mitigate the health effects of increasing UV levels, it is envisaged that the effectiveness of this project can be determined by comparing the predicted increase in UV-induced health effects with the statistics that result over time.

### **Follow-up of exposed populations**

As a result of accidents, nuclear processing and the testing of nuclear weapons, there are a number of populations exposed, or potentially exposed to environmental radiation at levels which raise concern for health. Among these are the several million exposed persons living in the areas most heavily contaminated by fallout from the Chernobyl accident in 1986.

Under the heading Follow-up to the Chernobyl Accident, WHO is restructuring and further developing its activities formerly undertaken as pilot projects through the International Programme on the Health Effects of the Chernobyl Accident (IPHECA) and other programmes.

IPHECA provided an umbrella under which WHO encouraged and facilitated the co-ordination of activities internationally, including the publication of a detailed catalogue of health related studies planned or in progress. These activities continue and will be expanded as appropriate.

Building on the results of the IPHECA pilot projects and activities of EURO and IARC WHO proposes to continue and further develop its activities related to the Chernobyl accident in the following priority areas;

- I. *Thyroid disease (International Thyroid Project)*
- II. *Health effects in accident recovery workers (Accident Recovery Workers Project)*
- III. *Dose reconstruction of exposed populations and individuals (Dose Reconstruction Project)*

The primary objective of these activities is to assist the affected countries in dealing with the public health consequences of the accident. In the process of assistance to affected populations, much of scientific value will be gained from studies conducted on the data collected.

WHO is also currently involved in developing programmes to investigate effects in populations exposed to weapons testing.

## Research

In addition to providing assistance to exposed populations, some of WHO's activities focus on the conduct of research on the health consequences of exposure to radiation. Populations exposed as a result of accidents, as well as populations exposed in routine operations of nuclear facilities or in the manufacture and testing of nuclear weapons, may, if carefully studied, provide important information on the effects on health of specific exposure regimes.

Ongoing studies include the IARC studies of nuclear industry workers. Results have recently been published from an international combined study of close to 100 000 nuclear industry workers in Canada, the United Kingdom and the United States. An International Collaborative Study of Cancer Risk among Radiation Workers in the Nuclear Industry, covering approximately 600 000 workers

in 14 countries, is now underway. The objective is to derive even more precise estimates of the carcinogenic effects of low dose chronic exposures to ionizing radiation for comparison with the risk estimates derived from studies of persons having received high dose/high dose-rate exposures. Studies of Chernobyl accident recovery workers and of thyroid cancer in young people in Belarus and Russia, are also underway with the aim of answering some of the outstanding questions on radiation risk. Information from these studies will have important public health and radiation protection implications.

Technologies requiring electric power and using various regimes of EMF for mobile telecommunications are expanding so rapidly that scientific research into possible health effects has been unable to keep pace with the new developments. Under the International EMF Project it is intended to monitor and review

scientific studies on the effects of electromagnetic fields on human beings. From these reviews there will be a focus on identifying key gaps in knowledge, in order to prepare protocols for the needed research and encourage research programmes in these areas that will fill the gaps required to allow more meaningful human health risk assessments. WHO/IARC will then conduct formal health risk assessment following the publication of these research results.

Research needs were identified for the INTERSUN Project by the WHO Task Group meeting on Ultraviolet Radiation held in December 1993. Two issues underscore the need for conducting studies of health risks of UV exposure. There is strong evidence of ozone layer depletion that will continue for many years. Consequent increases in ambient UV, which will impact on health, and the overall aging of the population world-wide, will further compound the magnitude of

health problems to be addressed. With 20% of blindness in the world caused by UV exposure, there is an urgent need for research into effects of UV on the eye.

To properly assess the health effects caused by UV exposure, it is necessary to determine, as precisely as possible, the UV dose to individuals or average doses to defined populations. Thus research into accurate methods for monitoring individuals and populations exposed to UV is necessary. Many questions about the relationship between sun exposure and both melanoma and non-melanocytic skin cancer need to be addressed. A 10% depletion in ozone layer will increase non-melanocytic skin cancers by 300,000 and melanomas by 4,500 per year. Important laboratory evidence exists that suppression of immune functions results from UV exposure of humans and this needs to be adequately assessed to determine the consequent risk to human health and particularly

the impact on resistance to infectious diseases and the effectiveness of vaccination programmes.

### **Networking for information exchange**

#### ***Networking***

The Global Environmental Epidemiology Network (GEENET) was established in 1987 under the WHO Global Environmental Health Networks initiative. Its objective is to further cooperation and coordination among professionals working on the health effects of environmental hazards, by strengthening education, training and applied research in health effects assessment and environmental epidemiology. Activities are supported by the Office of Global and Integrated Environmental Health at WHO headquarters, the environmental health staff in the six WHO Regional Offices, and associated technical centres. GEENET produces documents on development and promotion of

environmental epidemiology research and training. These, together with lists of Network members, are distributed regularly and are made available electronically via Internet. GEENET also organizes training 22 October 1997 and research workshops in collaboration with national and international agencies.

The Global Health and Environment Library Network (GELNET) was created to facilitate provision of the key scientific and technical information on health and environment issues available from WHO, UNEP and other international organizations, to libraries acting as a database on health and environment issues. The Documentation Centre of the WHO Programme for the Promotion of Environmental Health manages the Network.

***Information dissemination: the WHO and IARC home pages***

Information on WHO activities in the field health and environment available on the WHO World Wide Web at the following address: <http://www.who.ch>, under WHO Major Programmes, and WHO Programme for the Promotion of Environmental Health. For example, the home page for the International EMF Project is:

<http://www.who.ch/programmes/peh/emf/emf-home.htm> The IARC home page is at the following address: <http://www.iarc.fr>. Links to GEENET and GELNET are established.