CONFERENCE ON THE PUBLIC HEALTH ASPECTS OF PROTECTION AGAINST IONIZING RADIATION

Düsseldorf
25 June-4 July 1962

REGIONAL OFFICE FOR EUROPE
World Health Organization
COPENHAGEN
Note

The views expressed in this report are those of participants in the Conference and do not necessarily reflect the policy of the World Health Organization.

This report has been prepared by the Regional Office for Europe of the World Health Organization for distribution to governments of Member States concerned and to participants in the Conference on Public Health Aspects of Protection against Ionizing Radiation, Düsseldorf. A limited number of copies for persons officially or professionally concerned with this subject are available and may be obtained on request from the WHO Regional Office for Europe, Copenhagen.
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FOREWORD

Mankind is living and must continue to live with man-made ionizing radiation in addition to that which has emanated from natural sources throughout the ages. The benefit that can be derived from ionizing radiation is unchallenged. Scientists and the public health authorities, however, are becoming more and more concerned over the risks to the health of man and his offspring.

Undoubtedly, protection against ionizing radiation presents numerous problems, both scientifically and organizationally. Some countries have already succeeded in organizing efficient radiation protection services within their public health structure, and in developing legislation for the protection of those who handle ionizing radiation, as well as for the public as a whole. Others are still at the planning stage.

The World Health Organization considers it an obligation to assist Member States in establishing the role of the public health authorities in the field of radiation protection. In addition to current activities, both Headquarters and the Regional Office had planned to hold meetings in 1963 in which this problem was to be discussed. The agendas of both meetings had much in common and it was therefore decided to merge them into one. It thus became possible to organize a worldwide conference in which participants from almost all parts of the world could meet to discuss the current situation and desirable trends in a field of great importance to the future of mankind.

This report of the meeting will, it is hoped, act as a stimulus to activity, both national and international.
INTRODUCTION

The Conference on Public Health Aspects of Protection against Ionizing Radiation was convened by the World Health Organization at Düsseldorf, Federal Republic of Germany, from 25 June to 4 July 1962. It was designed to examine the part which public health authorities should play in controlling the hazards of ionizing radiation, and it was attended by 63 participants from 36 countries and from a number of international organizations.

The aims of the Conference, as stated in the letter of invitation to participants, were:

(a) to specify the role of public health services in respect of radiation protection;

(b) to review, on the basis of existing material and information to be made available at the Conference, the present situation of radiation protection services in different countries and to discuss desirable trends in the organization and administration of these services within the public health services; and

(c) to consider requirements as regards qualifications and training of public health personnel in charge of radiation protection services.

Dr Elisabeth Schwarzhaupt, Minister of Health of the Federal Republic of Germany, welcomed the participants on behalf of her Government and said that the outcome of the meeting would be of interest to countries throughout the world.
Dr J.D. Cottrell, Deputy Regional Director of the WHO Regional Office for Europe, opening the Conference, thanked the Federal Government, the Government of North-Rhine-Westphalia and the City of Düsseldorf for their co-operation in the preparation of the meeting and especially for the excellent facilities provided at the Karl-Arnold-Haus.

The Conference elected Dr S. Halter, Director-General of Hygiene, Ministry of Public Health and Family Welfare, Belgium, as its Chairman. Mr W. Dümmer, Chief Engineer, Industrial Hygiene Division, Santiago, Chile; Dr F.G. Krotkov, USSR Academy of Medical Sciences, Moscow; and Dr M.A. Qureshi, Deputy Assistant Director-General, Ministry of Health, Labour and Welfare, Pakistan, were elected Deputy Chairmen; and Dr W. Rottenberg, Deputy Chief, Radiation Protection Section, Federal Public Health Service, Switzerland, Rapporteur.

The programme of the Conference centred around seven major topics:

1. ionizing radiation as a public health problem;
2. principles of public health in radiation protection;
3. review of existing laws, regulations, codes of practice and examples of radiation protection services;
4. the role of public health radiation protection services;
5. the role of public health services in planning for and dealing with emergencies (incidents and accidents);
(6) qualifications and training of public health personnel in charge of radiation protection services;

(7) health education of the public in the field of radiation protection.

Each of these topics was introduced by one or more speakers. They were then taken up in discussion in plenary session and, in order to allow fuller exploration of the details, sometimes also in working groups. Panel discussions were conducted on the fifth and sixth topics.
1. IONIZING RADIATION AS A PUBLIC HEALTH PROBLEM

1.1 Basic facts

The papers and the discussion of the first theme revealed the basic facts which were to provide a starting-point for the discussions on the subsequent themes. Their exposition at the outset of the Conference made it possible during the remainder of the meeting to discuss them fully in formal and informal session.

The first relevant fact is that our senses do not warn us of irradiation by ionizing radiations, and so it is possible to be exposed to damaging and lethal doses and yet be quite unaware of it. This fact points to the need for adequate instrumentation and monitoring and to some system of registration or notification, so that public health services may be cognizant of establishments where a potential public health hazard from ionizing radiation exists.

The second relevant fact is that ionizing radiations have a deleterious genetic effect. Their other effects are in many ways no different from those produced by many other toxic substances, and the public health aspects of those effects are familiar. But the genetic effect raises a problem affecting the whole community.

The injury or ill-health suffered by a worker in his occupation is normally of limited effect, confined to his own suffering and the social effect on his dependants. But if he suffers genetic damage, it may be transmitted to future generations through offspring subsequently conceived.
It is clearly a hazard to the community. The deduction is that irradiation of anybody in the community, whether he be a worker or an ordinary member of the public, is a public health problem.

The third relevant fact is that many effects of ionizing radiations, especially those induced by small doses, are delayed, often for years. There is, at any rate, no gross manifestation to give warning of the damage. The emphasis, therefore, is on prevention.

This emphasis receives added weight from the nature of the somatic effects. They are no different from diseases which occur naturally. In the individual exposed to ionizing radiation, it will often be impossible to decide whether such a disease should be attributed to the exposure. In the population, the increased incidence of such a disease would be detected only by statistical methods.

The fourth relevant fact is the dependence of the incidence of somatic and genetic damage on dose, particularly at low levels of irradiation. It is not known certainly whether there is a threshold dose below which the effect is zero or whether even the smallest dose produces some effect. It is assumed for the purpose of adequate protection that the latter is true, and it follows that any irradiation by ionizing radiations is to be considered harmful: irradiation must be kept to the minimum practicable.

The concept of reducing irradiation to the minimum practicable was, naturally, examined closely by the Conference. The reason for it has just been stated; fundamentally it
stems from inadequate knowledge of low-level effects of irradiation and the possibility (or as some would have it, the probability, at least with the genetic damage) that any irradiation, however small, will produce some deleterious effect.

But in our ordinary daily tasks we habitually and in the main readily and cheerfully accept deleterious effects and slight risks. When the deleterious effects of a given dose of irradiation is no greater, no less acceptable than those we already receive, it may be argued that the given dose is safe for all practical purposes.

However, it is not usually possible to make so simple an evaluation. The comparison with other public health hazards is essentially a comparison of unlike things. It is not really possible to compare the hazard of a slight increase in mutations with the slight hazard of infection from smallpox.

In practice, the judgement of what is an acceptable hazard from irradiation by ionizing radiations rests on a balancing of the advantages and disadvantages of a given use. It may be possible to accept the slight deleterious effect if the use is of undoubted advantage; but if the use is frivolous or if the same end can be achieved without the use of ionizing radiations, it may be desirable to prohibit that use.

The fifth relevant fact is the magnitude of the dose now received by the human and the contribution of various sources to this dose. The background, or natural, dose
of ionizing radiation to which we are subject varies from place to place, but averages about 0.1 r a year to the whole body, including the gonads. The average gonad dose from medical diagnostic radiation varies from country to country: estimates which have been made range from less than 0.01 r a year to 0.1 r a year. Irradiation from fall-out is considerably smaller, e.g., from ingested caesium 137, 0.01 r to 0.1 r in 30 years as estimated by the United Nations Scientific Committee on the Effects of Atomic Radiation in 1958.

The deduction here is that medical diagnostic radiation is the principal contribution to the radiation received by man additional to background radiation.

The implications of these fundamental concepts were taken up by speakers subsequently in the Conference, now one aspect, now another being emphasized according to the topic under discussion.

There were three papers on this theme, by Professor Krotkov, Dr Devik and Dr Dobson.

1.2 Preventive measures

Professor Krotkov illustrated the role of the health officer by reference to the precautions adopted in the USSR.

The special susceptibility of the young to the effects of ionizing radiation is well known. People younger than eighteen are not employed on work with ionizing radiation.
Certain physiological systems are particularly sensitive to ionizing radiations. Pre-employment medical examinations are given so that people with diseases of these systems may not be employed: such diseases, for example, are lesions of the haemopoietic system, diseases of the blood and central nervous system, and abnormal heart, liver and kidney functions.

Workers with ionizing radiations are given periodic medical examinations so that early effects of chronic low-level irradiation may be recognized. Among the early reversible slight effects which have been noticed are increased leukocyte and lymphocyte counts, an increase in metabolic activity of thyroid and adrenal glands, increased blood pressure and pulse wave and, in the protein fraction of the blood, an increase of alpha and beta globulin with decrease of albumin.

Certain classes of workers with ionizing radiation, like other workers subject in their employment to exceptional physical, mental or psychological stress, receive privileges of longer holidays, shorter working hours, free board and special food.

Control of environmental contamination is in the hands of the public health service. The sanitation and epidemiological service controls the transport of radioactive material and the disposal of radioactive waste, gives guidance on laundering radioactive clothing, and formulates rules for work with radioactive substances.

1.3 Sources of irradiation

Dr Devik summarized some of the basic quantitative facts of the hazard of ionizing radiation.
The most important source of artificial irradiation is medical. In diagnostic radiology, doses ranging from less than 0.1 r to about 10 r, occasionally, may be given. For therapeutic purposes, much higher doses are given locally, several hundred r for benign and several thousand r for malignant conditions. The average gonad dose from medical exposure depends on many factors, including frequency of diagnostic irradiation and the attention given to reducing the dose of an individual exposure as far as practicable: as previously stated, published figures range from 0.01 r to 0.1 r per year.

These values, and the much lower ones received from fallout, are to be compared with the International Commission on Radiological Protection's recommendation of not more than 5 r per 30 years per head averaged over the whole population, and with the doses which are known to cause harmful effects.

A whole body dose of 200 r may cause severe disease; 400 r - 600 r may be lethal. A very approximate table may be drawn up showing the effect of irradiation of particular organs:

<table>
<thead>
<tr>
<th></th>
<th>Slight Effect</th>
<th>Pronounced</th>
<th>Severe</th>
</tr>
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<tbody>
<tr>
<td>Blood-forming tissues</td>
<td>a few r</td>
<td>&gt;100 r</td>
<td>400 r - 600 r</td>
</tr>
<tr>
<td>(bone marrow)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nervous system</td>
<td>&lt;1 r</td>
<td>1000 r</td>
<td>several 1000 r</td>
</tr>
<tr>
<td>Skin</td>
<td>500 r</td>
<td>&gt;1000 r</td>
<td></td>
</tr>
</tbody>
</table>
Cancer appears to have arisen in some cases after about 200 r local irradiation. In most instances of radiation-induced cancer much higher doses have been involved.

1.4 Radiation in perspective

Dr Dobson's paper was concerned to put radiation into perspective. It is an important point, for public health authorities are called on to assess the amount of effort which may justifiably be devoted to controlling the radiation hazard, and this effort may be at the expense of controlling other public health hazards.

In many respects, there is a new emphasis in public health. We are passing out of a phase in which control of infectious diseases and provision of adequate food and housing were prominent, to a new phase in which the effects of small concentrations of pollutants in our environment call for study. Our rapidly changing, complex industrial society is responsible for the pollution; ionizing radiation is but one of the pollutants.

However, many factors combine to give radiation a special prominence: the psychological factor related to nuclear explosions; the physical factor - its effects, imperceptible to our senses, generating a fear of the mysterious and unknown; biological factors, owing to the genetic effect and the delayed somatic effects.

The genetic effects of ionizing radiations have been studied far more intensively and carefully than those of other comparable agents, and the use of ionizing radiations has been controlled rigorously, with gratifying results for
the health of workers and the public. Yet although several hundred chemical agents are known to be mutagenic in certain living organisms, none has been subject to the same thorough investigation and control. Some of these mutagens are used in medicine, some are widely distributed in the environment, some are in foods and beverages, some are in industrial effluvia.

The disproportionate effort (from the public health standpoint) devoted to the effects of ionizing radiations tends to emphasize their hazards. There is certainly need for the same thorough investigation of the other pollutants.

1.5 Discussion

The discussion of these papers concentrated on a point of considerable importance and interest:

The present philosophy of control of the hazards of ionizing radiations is based on the assumption that there is a deleterious effect even with small vanishing doses. If this assumption should be wrong, it seems possible that lower standards of protection could be tolerated with consequent saving of effort which might usefully be devoted to other channels for the benefit of mankind.

However, until this point can be resolved, it is hardly possible to put the hazard into proper perspective. Meanwhile, there is need for more and more accurate knowledge of the effects of chronic low-level irradiation. The difficulties in the way of getting this knowledge are not underestimated. Animal experiments require enormous numbers of animals and are consequently expensive. Even if, as was
suggested, a simpler, perhaps less accurate, method were devised to recognize the effects, uncertainty would remain in extrapolating the results to man.

Yet direct studies of man are even more difficult. Studies of populations in Brazil, Chile, India and the USA, which are naturally subject to higher than normal levels of irradiation, are in progress, but results cannot be expected for some time. Even when they are published, they may prove to be inconclusive. It is difficult to obtain a suitable control population and in the comparison of two large populations other differences inevitably exist whose effects may well mask the small effects expected from the different levels of radiation.

The broad conclusions which emerged from discussion of the first theme were:

(1) Because it is not certain that there is a threshold level (or threshold levels for the different effects) below which no effect occurs, it is necessary to restrict radiation levels to the lowest practicable.

(2) It seems unlikely that in the near future sufficient new knowledge will emerge to change this view.

(3) Probably the same view could profitably be adopted towards some other environmental pollutants, but this could hardly justify a relaxation of the control of ionizing radiations.

(4) The main contribution to artificial irradiation is medical.
2. PRINCIPLES OF PUBLIC HEALTH IN RADIATION PROTECTION

Having recognized the need to keep irradiation of the public to the lowest practicable level and aware of the different ways, affecting many aspects of living, in which irradiation occurs, the Conference examined what part the public health services should play in its control. It heard papers by Dr Halter and Professor Pellerin on this theme.

2.1 Safeguarding the public health

Neither speaker had any doubt that overall control should rest with the public health services. While other departments of government may have a real and sometimes vital interest, e.g., in regard to the contamination of agricultural products by fall-out, their interests are incidental to their main function. The responsibility of the public health services is to safeguard the health of the population. Protection against ionizing radiation is only one of the many protections necessary for promoting and creating the conditions for improving the standard of health of the population. Other departments of government, too often concerned with their main purpose, may be unduly influenced by other considerations. The public health services, uninfluenced by these considerations, have the public confidence in this field.

Dr Halter listed seven main tasks for the public health services in their control of ionizing radiation:

(1) to define permissible levels of radiation and contamination for various groups in the population and to adapt these standards to the need of the population in the light of experience;
(2) to establish appropriate methods of control in order to measure the dose of radiation received; records of doses must be maintained to assess the genetic hazard;

(3) to survey the sources of radiation in order to ensure that radiation is as low as practicable and that there are no unjustified sources of radiation;

(4) to plan emergency measures in case the permissible levels are exceeded, either by accident or wilfully;

(5) to issue practical rules for guidance; to educate workers, employers and the public, so that they appreciate the importance of observing these rules; and to ensure that the rules are observed;

(6) to assess the balance of advantage and disadvantage of uses of ionizing radiation and radioactive materials;

(7) to collaborate with users for the satisfactory solution of technical problems.

Professor Pellerin put forward similar views. If the surveillance of the public health services is to be carried out intelligently, there must be a supporting research programme: pure research to measure significant trends and applied research based on analysis of the survey results. The pure research should cover radiobiology, radiotoxicology and dosimetry, and the applied research - radiochemical analysis and dosimetry.

The public health service must maintain close collaboration with university research workers, the atomic energy authorities, other interested government departments and the police and military authorities.
An important part of the work of the public health service is to instruct and inform the public. An appropriate documentation and reference service will provide the necessary basis. The dissemination of authenticated, well-documented information can do much to dispel the exaggerated fears often expressed in newspapers.

2.1.1 Discussion

The discussion of these two papers brought out clearly the differences in stages of development in different countries, both in their use of ionizing radiation and in the evolution of radiation protection services.

Where the use of ionizing radiation is small, there is no need for an elaborate system of control. Moreover, in some countries the urgent need for other public health measures means that little time or effort can be spared for protection against ionizing radiation. The eradication of infectious diseases, the provision of safe water-supplies and adequate sanitary services, the building of houses, the provision of adequate food, these and many other problems assume priority.

Yet it was felt that even in those countries a start could be made by tackling the principal source of artificial irradiation, i.e., the medical source. The topic was taken up at a later stage of the meeting.

The views expressed in the papers were generally endorsed as indicating the lines along which radiation protection services should be developed, but two reservations were expressed in discussion:
(1) It was felt that the assessment of the balance of advantage and disadvantage in any given use of ionizing radiation could not be assessed by the public health services alone, and that the final decision to permit or prohibit the use would rest with the government as a whole, and not with the public health services only.

In some - for example, the medical uses - essentially only health considerations might be involved and other considerations might be quite minor. Here, the public health services might well take the decision alone. With other uses - for example, military uses and the development of nuclear power stations (in fact, probably with the majority of uses) - many other interests would be involved. It would always be essential for the public health services to have an opportunity to express their views adequately, but it was conceivable that the national interest might require a decision against their views.

(2) The other reservation concerned the concept of a single public health service. One of the four discussion groups was of the opinion that it was not essential that all public health aspects should be controlled by one department of government.

No doubt, it would be a neater administrative solution if all aspects of public irradiation, in this context including occupational exposure because of the genetic implication, were under one control that would facilitate assessment of overall exposure of the population. However, other administrative considerations might make it undesirable and, in principle, there seemed to be no reason why a decentralized system could not be made to work.
2.2 Promotion of research

Dr Müller, giving the third paper on this theme, discussed the responsibility of public health services for scientific research.

Research need not be directly under the control of the public health service, but the latter had a responsibility for ensuring that adequate research is being done. Five fields for research were considered:

(1) The relationship between dose and effect in molecules, in the cell, in animals and in man, where there is need for greater precision in our knowledge. Research in this field is of considerable importance to public health, since it may lead to a clearer appreciation of the need for very costly measures of protection.

(2) Accidental exposure. The public health services should be alert to obtain as much information as possible which may assist early diagnosis and therapy. Long-term follow-up of patients who have been accidentally exposed, and their offspring, may provide valuable information.

(3) Improved methods for use in pre-employment and occupational medical examinations, which can give early warning of the effects of chronic low-level irradiation. One approach might be the study of somatic mutations in workers with ionizing radiations.

(4) The study of populations exposed to different natural levels of radiation. While superficially attractive, such studies are extremely difficult, as discussed earlier.
(5) Ways of reducing exposure. There is the need to investigate these in a wide range of activities (medical and dental work, treatment of radioactive wastes, behaviour of radionuclides in food chains, and so on).

2.2.1 Discussion

Dr Müller's paper stimulated lively interest. It was accepted that research was needed in the areas outlined in the paper and that the public health services should stimulate such research.

In countries where the use of ionizing radiation and radioactive materials is small, there is often preoccupation with other public health problems, so that neither the trained staff nor the effort is available for research on public health problems of ionizing radiation. In these countries, the public health services should ensure that they are fully cognizant of the research being done elsewhere. Here, the services of the World Health Organization and other international organizations can be especially helpful.

In countries where there is more extensive use of ionizing radiations, the need for research is greater. The discussion was concerned with whether the public health services should undertake that. In many countries, the nuclear energy authority would do much of the research. Then, the need was for the public health services to collaborate, if not actively in the research, at any rate in discussion of the results, and to stimulate work in areas important to public health.

At the other end of the scale, some of the research might be done by authorities which are not necessarily integrated
with the governmental public health services, e.g., medical schools, water and pollution research laboratories, food and agricultural laboratories.

The common need in all countries, whatever their state of development, is for the public health services to learn about the results of research and attempt to steer research effort into areas vital to the public health interests.
Having examined the principles on which public health control should be based, the Conference proceeded to discuss how far these principles had been given practical effect in legislation and codes of practice. Five papers were read: an introductory review by Mr Kenny, and papers by Dr Lacambre, Dr Krebs, Dr Clemenson and Mr Smith describing the laws, regulations and protection services in France, Germany, Sweden and the United Kingdom, respectively. Reviews of the legislation in Denmark, Italy, Norway and Pakistan, and a paper by the World Health Organization on public health radiation protection services in various countries were circulated.

3.1 Introductory material

Mr Kenny's review showed first how all codes and regulations stem from the recommendations of the International Commission on Radiological Protection, so that there was a wide degree of conformity in the standards adopted in different countries. Yet the recommendations were not written as legal documents to be followed to the letter. They had occasionally been misread by a too-zealous interpretation of the minutiae of the phraseology.

More seriously, the term "maximum permissible level" has been widely misunderstood and misused. It is a level at which, in the Commission's opinion, there is a negligible probability of undesirable effects. It does not follow that undesirable effects will necessarily occur above that level nor that the effects which may occur at levels of exposure appreciably above the maximum permissible will necessarily be unacceptable, when balanced against the gain. The adoption of these levels as fixed permissible levels in legislation is therefore preferably to be avoided.
The recommendations by the International Commission on Radiological Protection refer to radiation additional to background and medical radiation. There is a tendency in legislation and codes to follow this lead, with the result that the legislation is mainly concerned with regulating other ways in which the worker and the population may be irradiated. Since medical irradiation is the principal source of artificial irradiation, this represents to some degree a misdirection of legislative effort.

There are innumerable national codes of practice relating to particular uses of ionizing radiation which it would be quite impracticable to review. Three codes with a wide international influence were described, those of the International Labour Organisation, EURATOM and the International Atomic Energy Agency. Inter alia, they require:

(1) medical examination of workers before and during employment with ionizing radiation;

(2) the promulgation of rules for shielding and handling sources of ionizing radiation;

(3) compulsory reporting of activities in which ionizing radiations are used, subject to exceptions for small amounts;

(4) prohibition, unless specifically authorized, of the medical use of radioactive materials and the addition of radioactive materials to food-stuffs, pharmaceuticals, cosmetics and household goods;

(5) prohibition of irradiation of persons, except by doctors and dentists;

(6) prohibition of employment of young people and pregnant women;
(7) employment of technically-competent persons to ensure that appropriate regulations are drawn up and enforced; and

(8) the regular measurement of radiation levels in and near nuclear establishments.

Thanks to the wide influence of these organizations, the above requirements have been implemented in the legislation of many countries. An exception is (5) which implicitly prohibits the use of shoe-fitting machines (pedoscopes): in many countries their use is still permitted.

Some forty countries have legislation for protection against ionizing radiations, and the fundamental requirement is the necessity to register or to obtain a licence for their handling.

Sometimes, however, the requirement to register or obtain a licence applies only to the use of radioactive materials, the use of X-ray machines remaining outside the system of control. The machines may then be controlled in another way, as by regulations or codes of practice in State-controlled hospitals.

Instead of registration or licensing, control may also be exercised through the supply of radioactive materials and, where there is a State monopoly, of X-ray machines.

The description of the legislative provisions obtaining in four countries showed the widely different ways in which control is exercised. In Sweden, one authority, the National Board of Health, is responsible for all protective measures against ionizing radiation and for supervision of employees and institutions; a similar method is in force in other Scandinavian countries.
In France, the Ministry of Public Health is responsible for protection of the population and of medical staff and their patients. Other ministries, including the Ministries of Labour, Industry, Works and the Interior, share the responsibility with the Ministry of Public Health in their respective fields.

In the United Kingdom, several ministries are responsible for the public health aspects of ionizing radiations, including the Ministry of Health (medical X-rays), Ministry of Agriculture, Fisheries and Food, Ministry of Housing and Local Government (water and waste disposal) and Ministry of Labour (workers).

In the Federal Republic of Germany, regulations are made by the Federal Government and implemented by the Länder. The Minister for Atomic Energy issues regulations concerning the sale, use, transport and disposal of radioactive materials and waste. The Minister of Health issues regulations for the application of X-rays.

3.2 Discussion

Again, the great difference in what is practicable in countries at different stages of development was brought out. The papers presented showed how control is effected in countries where the technically-trained staff is available.

In other countries, the approach could be different and, in order to ensure maximum benefit with the minimum of effort, should be different. Here, a beginning should be made by concentrating on the sources which contribute the biggest radiation dose, either to the individual or to the population. Next, or concurrently, the training of staff should be undertaken and then, gradually, all sources of radiation could be brought under
control. It might be better to bring sources under control one at a time rather than all together, so as to restrict inspection to what could be done with the staff available.

Two examples of sources requiring immediate control were mentioned: medical sources and exposure to radon in mines. The former was discussed in a later session. The discussion of the latter between the participants from countries with experience in the field led to the conclusion that in properly-ventilated mines radon levels were satisfactory. Older mines and small mines with inadequate ventilation were usually the offenders.

It was noted that although the four countries whose legislation was examined had very different systems of government, the broad legislative control was similar. Licensing, adequate inspection, and the power to specify conditions of employment and allowable exposure levels for all classes of the population were the fundamental requirements for adequate control. Even with adequate legislation, however, public health services would be ineffective without adequate and properly-trained staff to implement it.

There was some discussion whether premises or persons should be licensed, and it was agreed that both were important. Either inadequate working conditions or incompetent persons could cause hazardous conditions. In practice, it would not seem to matter which was licensed provided the other was made a condition of the licence; i.e., premises could be licensed provided the work was under the control of specified persons.
The discussion turned again to natural levels of radiation and to the apparent illogicality of restricting artificial levels of radiation to less than the variation in natural levels. There was no official guidance on the acceptability of natural levels of radiation, e.g., in building materials or in a water-supply. The discussion, however, soon resolved this apparent anomaly. It might not be possible to prohibit a water-supply or certain building materials. Each case had to be considered individually, weighing advantage against disadvantage. General guidance was difficult to formulate, although it was not usually difficult to decide individual cases on common-sense lines.

The International Atomic Energy Agency Transport Regulations provide detailed rules for packaging, for radiation limits for packages and for criticality control, but the requirements for irradiation of transport workers and the public are less definite. The requirement is that the carrier shall ensure that the maximum permissible levels of exposure for various categories of persons are not being exceeded.

The participants felt that the need for control by the public health services was as important here as in other fields.
4. THE ROLE OF PUBLIC HEALTH RADIATION PROTECTION SERVICES

The Conference passed from consideration of the duties of public health services, and the legal powers they needed to perform those duties, to consideration of practical steps for the control of ionizing radiation hazards. Control of the normal uses of ionizing radiation was the subject discussed in papers by Dr Chadwick, Professor Seelentag and Mr Kenny.

4.1 Radiological equipment

Dr Chadwick dealt first with the control of X-ray machines.

The dose is determined by the equipment, installation and accessories, by the techniques used, and by the judgment as to when an X-ray is needed.

The last is primarily a matter for the medical profession, which should establish criteria for the guidance of its members. Efforts in this direction have already been made in the USA, e.g., in connexion with mass chest X-ray surveys. Critical examination of the need for certain X-ray diagnostic procedures has induced greater caution in their use. For example, paediatricians are abandoning routine fluoroscopy and pelvimetry is being used less frequently.

The other two factors which determine the dose are susceptible to external control. In the USA simple procedures for inspection have been developed which can be carried out by personnel with relatively little advanced training. Listed
approximately in order of importance, the following factors can be assessed by inspectors after modest training:

(1) beam size,
(2) beam alignment,
(3) filtration,
(4) target-to-skin distance,
(5) availability and use of gonadal shields,
(6) speed of film,
(7) speed of intensifying screens,
(8) output of X-ray machines, and
(9) tube housing leakage.

In all but a very few procedures, adequate beam limitation can prevent irradiation of the gonads. It is simple to provide lead collimating washers and aluminum filters of various diameters so that the proper size can be fitted into the tube housing and effect an important reduction in the irradiation of patients and operators.

Although inspection can check the presence of beam limitation devices, it cannot ensure that they are used. A concurrent educational programme for physicians, dentists and technicians is therefore necessary.
A method of survey without on-the-spot inspection has been developed for dental X-ray machines. A film-pack with instructions is sent to the dentist who sends it back for evaluation after performing the survey. With medical X-ray machines, the problem is more complex and it seems quite unlikely that a substitute for on-the-spot evaluation will be developed.

4.2 Environmental contamination

Dr Chadwick then turned to the control of environmental contamination.

It is sometimes possible to rely on determinations of gross beta-activity, but such determinations are essentially a screening procedure to indicate where and when additional data on specific radionuclides is desirable. At higher levels determinations of specific radionuclides in the environment is essential, and it may be necessary also to obtain measurements of contaminated persons.

Experience has shown that air, rainfall and fresh milk are three of the most important items to be measured. In any specific situation air or water may be the principal pathway by which contamination is distributed. Regular surveys must be performed. In many countries, milk and dairy products are so important an item of the diet that they receive special attention and regular analyses for the radionuclides of greatest interest are made, for example, iodine 131, caesium 137, barium 140, strontium 89 and strontium 90.
Finally, Dr Chadwick considered what action might be needed if contamination levels were to become high.

The USA has moved away from the concept of fixed permissible levels and, in accordance with the principle of balancing advantages against disadvantages, has specified three ranges of levels within which the appropriate action is assessed according to the facts of the situation.

In Range I, the transient rate of intake is low and only periodic surveillance is required, the frequency of sampling being judged in the light of all the relevant facts. In Range II, the rate of intake is higher and calls for quantitative surveillance and routine control - that is, the rate of intake is measured continually and its trend observed.

The objective of the control is to assure that appropriate radiation doses or Radiation Protection Guides are not exceeded. The Radiation Protection Guide is the upper limit of Range II. Above that limit, in Range III, evaluation of the hazard is called for with appropriate measures, as necessary, to reduce intake.

These measures may be directed to the source of contamination or to the contaminated materials. The former is the more certain, but is not always possible, as with fall-out, and in any case is limited by economic considerations to a level where the cost of further reduction is unjustifiably high.
On the other hand, control of radionuclide intake in diet is subject to considerable difficulties and additional health problems would be posed, e.g., if a water-supply were condemned or milk banned. It may be possible to feed milch cows on previously harvested food during periods of heavy fall-out. Dried and stored milk can be used for short periods. Research on the feasibility of treatment processes is being done and may lead to practicable processes.

4.3 Reduction of unnecessary irradiation

In the second paper on the theme, Professor Seelentag demonstrated the considerable reduction in dose which can be achieved by proper control of the conditions of irradiation - control of both the equipment and the position of the patient.

Much can be done to reduce unnecessary irradiation without detriment to the medical benefit of X-ray procedures. The basis of effective control is accurate measurement of dose. Measurements on a large scale are necessary. Sporadic sampling, or the measurement of mere average values (as in determining the overall gonad dose in the population), are not enough. Regular dose and dose-rate measurements are especially desirable when new X-ray tubes are installed. Later, gonad and skin dose should be measured periodically. All types of X-ray equipment used for fluoroscopy should be provided with a device indicating the dose received by the patient.
4.5 Sources of irradiation and measures for their control

Mr Kenny's paper reviewed the ways in which the public may be irradiated:

(1) natural background, sometimes artificially increased by exposure of radioactive strata and dumping of slag from mining;

(2) radioactive materials in construction materials;

(3) inhalation and ingestion of natural radioactive materials;

(4) medical and dental irradiation and use of radioactive materials, including release of radioactive patients;

(5) fall-out;

(6) occupational exposure, both of radiation workers and of other workers in the establishment;

(7) direct irradiation of the public near or visiting establishments using radiation sources industrially;

(8) sale of radioactive materials;

(9) use of radioactive materials in public buildings, e.g., in fire detection devices;

(10) deliberate irradiation of individuals, as in shoe-fitting machines;
(11) transport of radioactive materials;
(12) disposal of radioactive waste;
(13) accidents.

The following positive measures of control can be taken by the public health services:

(1) to obtain knowledge of the whereabouts of sources of radiation;
(2) to inspect and measure radiation and contamination levels in and near premises;
(3) to inspect the manner in which sources are used and to specify improvements to reduce levels of irradiation;
(4) to measure the activity of commonly used materials, including diet;
(5) to check frequently on the location of sealed sources;
(6) to specify permissible levels of radiation and appropriate safe procedures, e.g., for waste disposal;
(7) to assess the total irradiation of the public.

4.6 Discussion

The discussion of these papers by the groups and in plenary session was one of the most stimulating of the Conference. To most participants, this theme - ways in which irradiation of the population could be reduced - was the heart of the matter.
The very great need to reduce the radiation dose from the medical and dental use of X-rays was accepted. Although it was generally felt that the necessity for X-ray examinations should be solely within the discretion of the professional consultant, it was also felt that doctors and dentists were not fully aware of the need to restrict examinations to the minimum necessary for proper treatment. There should always be a positive need for the examination: it should not be done as a routine. It was considered important to include instruction on this matter in professional training and to give guidance through the professional organizations.

While the need for the examination would not be subject to control, the equipment itself and the examination procedure are properly matters for control by the public health services. Even in countries where formal services of radiological protection have not been set up, much can be done by quite simple procedures to reduce considerably the dose from diagnostic X-radiation without detriment to the treatment of the patient.

The discussion also considered occupational irradiation of pregnant women and the foetus. There was agreement that, since the foetus should not be subjected to occupational levels of radiation, pregnant women ought not to be employed as radiation workers.

It is important, both for psychological reasons and to encourage early disclosure of the pregnancy, that the women should not suffer loss of salary or other benefits if transferred from radiation work. Since 90 per cent of workers with ionizing radiation in fact receive no more radiation than members of the general public, there would generally be no difficulty in transferring the woman to other work.
The foetus being most sensitive to radiation in the earliest stages of its development, before pregnancy is diagnosed, there is some argument for prohibiting the employment of women of reproductive age on work with ionizing radiation. The effect on the employment of women in such professions as nursing and radiology, however, would be too severe; it would be impracticable.

For the control of irradiation of the public as a result of the widespread uses of radioactive materials, a system of registration or some similar system is essential. It should be backed by inspection, designed as much to inculcate good practices as to penalize bad practices, and by adequate monitoring. To enable these measures to be put into effect, suitable legislation is necessary. Even in countries where the use of ionizing radiations is small, basic legislation should be framed so that the necessary controlling functions can be built up by the public health services as the demand requires.
5. THE ROLE OF PUBLIC HEALTH SERVICES IN PLANNING FOR AND DEALING WITH EMERGENCIES

Dr Spaander and Dr Biese read introductory papers on this subject.

5.1 Planning for emergencies

Dr Spaander considered the emergency brought about by the accidental release of radioactive material following an accident at a nuclear reactor.

Although the consequences cannot be predicted with any accuracy, it is essential to prepare a plan for emergency action. Planning should provide for:

1. the establishment of agreed levels of emergency exposure;

2. an estimate of the likely spread of radioactive contamination;

3. the manner in which the alarm should be given to the public health and other services;

4. definition of the responsible officers who will decide whether evacuation, the rejection of foodstuffs and other emergency measures should be put into effect;

5. holding exercises to test the plan and remedy deficiencies.
When there is the possibility of contamination spreading to another country, collaboration with officials in that country is essential.

5.2 Mobile operational teams and decontamination units

Dr Biese described the Radiation Protection Echelon of the Mobile Operational Unit of the German Red Cross.

It is a self-contained unit equipped with vehicles for the detection of contaminated areas, the measurement of radioactive materials and first-aid treatment for people who have inhaled or ingested radioactive materials.

The echelon comprises four groups. The first is provided with jeeps equipped with built-in, battery-operated dose-rate meters and radio-telephony sets. Its purpose is to collect samples and delineate contaminated areas. The second group is provided with mobile laboratories for the measurement of activity in solid and liquid samples. The third group, still being planned, is provided with a water-tank, tents and shower baths. The fourth group is a water purification unit.

The echelon is essentially for first-aid treatment. For hospital treatment of contaminated injured patients, five special centres for out- and in-patient treatment are being established in the Land of Nordrhein-Westphalia. Similar treatment facilities are planned for other Länder of the Federal Republic of Germany.
Such centres should be well sited for quick and safe access, and a team of trained physicians and nurses should be continuously available. In the hospital's daily routine work, the team will be engaged on diagnosis and therapy with unsealed radionuclides in a special ward with 8 to 10 beds in single rooms.

For contaminated patients, access will be through a special entrance. The patients will be monitored and, if necessary, decontaminated and given appropriate treatment in special wards and operating rooms.

There was an exhibition of vehicles of the Radiation Protection Echelon and of plans for the special centres.

5.3 Discussion

These two papers were discussed by the groups and in a panel, and some interesting additional considerations emerged.

It was pointed out that, if possible, planning for an emergency should be taken into account at the very beginning, when selecting the site. It should be considered when a license was applied for and the public health services should be brought in at that early stage, so that they could consider the public health implications of both normal and abnormal operation.

The decision to order evacuation or the rejection of foodstuffs would have to be weighed very carefully. The Conference had previously heard from Dr Chadwick that public
health considerations other than radiological were involved in the banning of foodstuffs. They would also arise if evacuation were ordered on any large scale.

Although the public health services would be intimately concerned with the planning and with the emergency decisions, they might not be well-equipped to carry out the decisions. Action might rest with the military or police, whose facilities were usually better suited to the purpose.

The attitude towards establishing mobile units and special treatment units varied, and to some extent was influenced by the size of the country of the participant. In a small densely populated country, the need for mobile units might be limited and existing laboratories might be used. In bigger countries with large distances between the centres of population, the need could be more clearly seen.

There was some discussion of accidents, other than those discussed by Dr Spaander, which might lead to the dispersal of radioactive materials: a fire involving a kilocurie source used, for example, for radiotherapy or food sterilization; a road accident or an aircraft crash during transport of radioactive materials; an aircraft crashing on a store of radioactive liquid waste; and deliberate sabotage. Although the amount of activity released might be less than from a reactor accident, the public health hazard could conceivably be greater since the radioactive material might not be so widely dispersed.

It was noted that the International Atomic Energy Agency transport regulations with its provisions for limiting the radioactive content of packages, the dose-rate at the surfaces
of packages, the type of package and the labelling of packages would go a long way to minimizing the effects of transport accidents. It was thought also that some system might be devised for notifying a country when potentially dangerous amounts of activity were transported through or over the country.

Some instruction could also be given to police and fire services to prevent large amounts of radioactive materials being washed into rivers and sewers after an accident.
6. QUALIFICATIONS AND TRAINING OF PUBLIC HEALTH PERSONNEL IN CHARGE OF RADIATION PROTECTION SERVICES

6.1 Introductory material

Dr Jammet, in his paper on the subject, referred to the Expert Committee on Professional and Technical Education of Medical and Auxiliary Personnel in its fourth and fifth reports.

For all personnel an indispensable requirement is a general knowledge of mathematics, physics, chemistry, biology and medicine. A more particular acquaintance is also required with the physics of radiations and radioactivity, radiobiological and radiopathological effects, the sources of irradiation of man, the meaning and application of maximum permissible levels, dosimetry and radiochemical estimations, methods of protection against radiations and contamination, and first-aid treatment after irradiation or contamination.

Only certain categories of public health workers need a specialized knowledge of certain of these topics: for example, the health physicist, for evaluation of sources and specification of protective measures; the factory doctor, for estimating hazards and urgent medical treatment; and the agriculturist, for estimating the importance of food chains.

Finally, a quite specialized knowledge is needed for those dealing with certain problems such as site selection, criticality, hazards, treatment and disposal of radioactive waste.

For the first category, requiring only general knowledge, a course of lectures lasting a few days should suffice. It should be in the normal course of training of doctors. For the second category, which would include doctors using X-rays and radionuclides, lectures are not enough. A course of initiation into the practices is required, lasting perhaps several weeks. For the last category, that of the specialist, courses lasting several months and designed to meet their special needs will be required. The courses should include conferences, practical work and demonstration.

6.2 Discussion

It was recognized that in the initial period of the development of nuclear energy, education and public health officials had been overtaken by events. In that period, it was perhaps fortunate that in many countries the atomic energy authorities had assumed responsibility for the public health aspects of the problem. Now, however, the public health authorities should take charge and their staffs should have adequate training for the task.

On the whole, although the view was by no means unanimous, it was thought that universities and technical colleges could give the instruction, either in normal graduate or in special postgraduate courses. There was also a need for
refresher courses, since the subject was still progressing rapidly. Close collaboration between the universities, atomic energy authorities and public health authorities should be maintained so that the training could be up to date and properly oriented.

Several speakers drew attention to the danger of a training exclusively in radiological protection. A broad knowledge of normal public health problems was essential if the radiological hazard was to be properly assessed and kept in perspective. This led other speakers to point out that a public health official, having received special training in radiological protection, would usually be able to command a better salary with the atomic energy authorities and would often be lost to the public health services. It seemed strange that a better financial reward could not be given to those who had obtained training in a field requiring knowledge of diverse and difficult disciplines.

The leading contribution of medical diagnostic radiology to human radiation was recognized in the emphasis placed on the need to train medical men and radiographers. Here, there was urgent need for training in a proper appreciation of the hazard.
7. HEALTH EDUCATION IN THE FIELD OF RADIATION PROTECTION

Throughout the Conference, the need for a proper appreciation of radiological hazards by the general public had been discussed in relation to other problems, especially that of placing the radiological hazard in perspective, so that it should not assume undue prominence in relation to other public health hazards. Ultimately, the pressure for action by the public health services came from the public and it was essential that they should be properly informed.

7.1 Introductory material

Yet, as Professor Boatman brought out in his paper, in this field it is not easy. First, the subject is technically complex and difficult, embracing many professions. Second, the topic has from the beginning been confused by the real fear of nuclear weapons and the political implications of fall-out from nuclear tests. Third, conflicting views have been voiced by prominent scientists. These and other news items have been reported, usually not too accurately, with dramatic headlines in popular news media.

The public health services should now disseminate to the public factual information and interpretations. Every public health worker, doctor, dentist, nurse or administrator who is in close contact with the people should have sufficient knowledge of the subject to alleviate and dispel public anxiety. In-service short courses for these people are helpful.
Public health services should have close working relations with the press. Prompt and continuing news conferences help to avoid sensationalism when emergencies arise. Short courses for news writers may be helpful. A special effort should be made to seek out other leaders of public opinion and acquaint them with first-hand information. Here teachers are an important group: through the children, the parents may be reached. A special group who can do effective public education are workers occupationally exposed to radiation.

The last point was illustrated in a short talk by Mr Rodier, who exhibited posters used in the French atomic energy establishment at Marcoule. These strikingly coloured posters, about 30 cm by 40 cm, are designed to shock or amuse and so fix the warning in the memory. They are frequently changed. It is important to avoid exaggeration, which is soon perceived and brings ridicule and disbelief in the warning.

7.2 Discussion

In the discussion other means of bringing the facts to the public were mentioned: the use of films, radio and television, which could bring in wide audiences.

It was questioned whether, in fact, the general public were as apprehensive as was generally supposed. Several speakers gave instances where proposals to establish nuclear energy establishments in rural areas were welcomed by the ordinary people as bringing in industry, but opposed by rural employers who foresaw competition for rural labour.
Those whose aim was to prevent the incursion of industry into rural areas were often not too scrupulous and exaggerated the radiological hazards to further their own opposition.

An objective evaluation of public reaction would be valuable. Too often the assessment rests on newspaper reporting which tends to emphasize the sensational or abnormal and ignore the normal. It is not considered worth reporting when no objection is taken to the siting of a nuclear reactor, but if a few individuals express the view that it will be dangerous, that opinion is news and will be reported.

It is usually found that people living near a nuclear energy establishment accept it and express no concern, whereas farther away some concern may be expressed. This is probably due to the influence of workers in the establishment: they live near and are able to reassure their neighbours. This experience suggests that the more the general public is allowed to see and experience for themselves the more reassured they will be. Visits for leaders of public opinion can help in this respect.

The view was also expressed that secrecy had become almost habitual in nuclear energy work, due to its connexion with nuclear bomb development. That attitude should be strongly discouraged and, as far as possible, all available means should be adopted to publicize the work and demonstrate the precautions taken.
8. CONCLUSION

The Conference was not convened to draw up formal decisions or a list of recommendations for future action by the World Health Organization or any other organization. It was arranged as an exchange of views between administrators and experts from a wide range of countries on the role of the public health services in the control of ionizing radiation hazards.

The success of the Conference is not to be measured in terms of the conclusions reached or even of the views expressed. It can be measured only by the extent of cross-fertilization of ideas and of the germination of those ideas when the participants return to their countries. And, as in so many other fields, once the impetus and direction has been given, the drive will lead on to new ideas and views not obviously related to those brought out in the Conference. There was clearly a wide measure of agreement on fundamental principles and no sharp divergence of opinion emerged.

This agreement was embodied in a final expression of views which is reproduced here to end this factual report of the proceedings:

1. The increasing use of ionizing radiation and the rapid development of new sources of irradiation are associated with growing health problems and are causing increasing concern.
2. The balancing of the advantages and disadvantages of these new uses and the decision as to whether they should be permitted or prohibited rests in each country with the government as a whole, but the administrative arrangements should be such as to allow the public health services to study the public health implications fully and to express their views before the decision is taken.

3. It is a striking fact that the biggest contribution at the present time to the irradiation of the population, in addition to natural radiation, is from medical uses of ionizing radiations. Consequently, the most effective method of immediately reducing the irradiation of the population is to control the medical uses of ionizing radiation, including dental uses.

4. The development of nuclear energy, despite the care which has so far been taken in the establishments where it has been employed, constitutes a potential danger because of the enormous quantities of highly radioactive substances involved, the transport of such materials, and the accumulation of radioactive wastes, for which no method of destruction exists.

5. Ionizing radiation is only one of many hazards to which populations are exposed in the increasingly complex environment in which we live. Alterations of the environment by ionizing radiation and other agents should be kept to the practicable minimum which is consistent with developments for the welfare and economic benefit of mankind. Like
some others of these agents, ionizing radiation can produce genetic damage. The irradiation of the population from whatever cause, including occupational exposure, is clearly of public health concern because it may provoke, besides the somatic effects, deleterious genetic effects.

6. Thus, public health services have important responsibilities for radiation protection. The public health services, that is, those services in a country which have general or particular responsibility for protecting the public health in the sense of the World Health Organization constitution, should be entrusted with the protection of the population from the dangers which may result from ionizing radiation.

7. The public health services, in order to discharge their responsibilities, should have functions which include ensuring that there is adequate legislation enabling them to maintain the irradiation of the population at the lowest practicable level, and should have adequate means to implement legislation, covering the following:

(1) powers to fix basic standards;

(2) provision for the public health services to be informed of all premises where ionizing radiations are used, e.g., through registration or licensing;

(3) public health service powers to carry out inspections and require suitable practices and preventive measures to avoid misuses and to ensure that ionizing radiations are used by competent people;
(4) powers to prohibit unjustifiable uses of ionizing radiation;

(5) public health services participation in official decisions as to whether and under what conditions major uses, such as atomic energy developments, are justifiable;

(6) responsibility of the public health services for periodic estimations of the over-all doses received by the population.

8. The functions of public health services should include also the stimulation of scientific research, which is the basis of better understanding of radiation hazards, and of improved methods of control. They should try to bring about the harmonization of methods and their interpretation. They should play an important role in the education and training of personnel, as well as in educating and informing the public concerning the various aspects of the uses and risks of ionizing radiation.

9. One of the main functions of the public health services should be to participate in planning and take part in the action required by the spread of radioactive substances.

10. Appropriate collaboration with other bodies on the national and international level is important.

11. The World Health Organization should continue its activities in this field.
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PROGRAMME OF THE CONFERENCE

Monday, 25 June

10.00  Opening of the Conference

11.30 - 12.30  PLENARY SESSION
    Appointment of Conference Officers
    Announcements by Secretariat

14.30 - 17.30  PLENARY SESSION
    First theme: Ionizing Radiation as a Public Health Problem
    1.1 "Sources and effects of radiation exposure: natural, medical, occupational and other" - Dr M.N. Fateeva, Dr F.G. Krotkov and Dr F. Devik
    Discussion
    1.2 "Radiation hazards in relation to other health hazards" - Dr R.L. Dobson
    Discussion

18.00  Official reception by the Ministry of Health of the Federal Republic of Germany at the Karl-Arnold-Haus
Tuesday, 26 June

9.30 - 12.30 PLENARY SESSION
Second theme: Principles of Public Health in Radiation Protection

2.1 "Nature of the responsibility of public health services" - Dr S. Halter

2.2 "Field of action of public health services and co-operation with other national and international bodies" - Professor P. Pellerin

Discussion of items 2.1 and 2.2 in working groups

14.30 - 17.30
Continuation of discussion of items 2.1 and 2.2 in working groups

Wednesday, 27 June

9.30 - 12.30 PLENARY SESSION
Reports of working groups
Discussion

2.3 "Responsibility of public health services for scientific research in the different fields of radiation protection" - Dr J. Müller

Discussion

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Wednesday, 27 June (contd)

14.30 - 17.30 PLENARY SESSION

Third theme: Review of Existing Laws, Regulations, Codes of Practice and Examples of Radiation Protection Services

Introduction by Mr A.W. Kenny
"Regulations and Organization of Radiation Protection Services"

Statements by participants:
- Dr O. Lacambre (France)
- Dr A. Krebs (Germany)
- Dr C-J. Clemedson (Sweden)
- Mr E.E. Smith (United Kingdom)

Discussion

Thursday, 28 June

9.30 - 13.00 PLENARY SESSION

Fourth theme: The Role of Public Health Radiation Protection Services

4.1 "Determination and evaluation of the radiation level of the population, including radiation workers" - Dr D.R. Chadwick
Annex 2

Thursday, 28 June (contd)

9.30 - 13.00

4.2 "Promotion of measures to control or reduce individual radiation doses from medical or occupational exposures" - Professor W. Seelentag

4.3 "Supervision of environmental contamination (air, water (including sea water), soil, food chain) and the application of corrective measures" - Mr A.W. Kenny

Discussion of items 4.1, 4.2 and 4.3 in working groups

Afternoon free

Friday, 29 June

9.30 - 12.30

Continuation of discussion of items 4.1, 4.2 and 4.3 in working groups

14.30 - 17.30

PLENARY SESSION

Fifth theme: The Role of Public Health Services in Planning for and Dealing with Emergencies (Incidents and Accidents)

Introduction by Dr P. Spaander

"Organization of mobile operational teams and special decontamination units" - Dr A. Biese

Discussion in working groups
Annex 2

Saturday, 30 June

9.30 - 12.30 PLENARY SESSION

Reports of working groups on discussions of the fourth theme

Discussion

Continuation of discussion on the fifth theme in working groups

Afternoon free

Sunday, 1 July

Free

Monday, 2 July

9.30 - 12.30 PLENARY SESSION

Report by a panel on the discussion of working groups on the fifth theme

Discussion

Sixth theme: Qualifications and Training of Public Health Personnel in charge of Radiation Protection Services

Introduction by Dr H. Jammet and a panel discussion

Discussion in working groups

14.30 - 17.30 Continuation of discussion of the sixth theme in working groups
Tuesday, 3 July

9.30 - 12.00  PLENARY SESSION
Reports of the working groups on the sixth theme
Seventh theme: Health Education in the Field of Radiation Protection
Introduction by Professor R. Boatman
Discussion

12.15 - 20.00  Field visit to the Reactor Centre, Jülich (Kernforschungsanlage Jülich des Landes Nordrhein-Westfalen e.V.)

Wednesday, 4 July

9.30  PLENARY SESSION
Summary and conclusions of the Conference
Closing of the Conference
LIST OF WORKING DOCUMENTS

EURO-234/1 Provisional list of documents
EURO-234/2 Provisional list of participants
EURO-234/3 Draft time-table
EURO-234/4 Radiation hazards in relation to other health hazards (Dr R.L. Dobson)
EURO-234/5 Nature of the responsibility of public health services (Dr S. Halter)
EURO-234/6 Field of action of public health services and co-operation with other national and international bodies (Professor P. Pellerin)
EURO-234/7 Responsibility of public health services for scientific research in the different fields of radiation protection (Dr J. Müller)
EURO-234/8 Review of existing laws, regulations, codes of practice and examples of radiation protection services (Mr A.W. Kenny)
EURO-234/9 Statement by Dr Odette Lacambre (France)
EURO-234/10 Statement by Dr A. Krebs (Federal Republic of Germany)
EURO-234/11 Statement by Dr C-J. Clemedson (Sweden)
EURO-234/12 Statement by Mr E.E. Smith (United Kingdom)
Organization of mobile operational teams and special decontamination units (Dr A. Biese)

Determination and evaluation of the radiation level of the population, including radiation workers (Dr D.R. Chadwick)

The promotion of measures to control or reduce individual and gonadal radiation doses from medical or occupational exposures (Professor W. Seelentag)

The supervision of environmental contamination and the application of corrective measures (Mr A.W. Kenny)

The role of public health services in planning for and dealing with emergencies (incidents and accidents) (Dr P. Spaander)

Qualifications and training of public health personnel in charge of radiation protection services (Dr H. Jammet)

Health education in the field of radiation protection (Professor R. Boatman)

Industrial health under conditions affected by ionizing radiation (Dr F.G. Krotkov and Dr M.N. Fateeva)