WORLD HEALTH ORGANIZATION
OFFICE OF THE DIRECTOR-GENERAL

~~REPORT OF THE~~ CONSULTANT GROUP ON ATOMIC ENERGY IN RELATION TO MEDICINE AND PUBLIC HEALTH

Palais des Nations, Geneva
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Summary report of discussions

Members of the Group:

Dr. J. Bugher - Chairman
Dr. A.J. Cipriani
Dr. J.F. Loutit
Dr. C. Manneback

THE DISCUSSIONS OF

SUMMARY REPORT OF THE CONSULTANT GROUP ON ATOMIC ENERGY IN RELATION TO MEDICINE AND PUBLIC HEALTH

1. The Group of Consultants invited by the Director-General of WHO to advise him on the general problems of atomic energy in relation to medicine and public health met at WHO headquarters, Palais des Nations, Geneva, on 13, 14 and 15 December 1954, with the Director-General, the Deputy Director-General and senior members of the staff, and held six meetings. The Consultant Group was composed of Dr. J. Bugher, Director, Division of Biology and Medicine, Atomic Energy Commission, United States of America; Dr. A.J. Cipriani, Director, Biology Division, Atomic Energy of Canada, Limited, Chalk River, Canada; Dr. J.F. Loutit, Director, Radio Biological Research Unit, Atomic Energy Research Establishment, Harwell, United Kingdom of Great Britain and Northern Ireland; and Dr. C. Manneback, Louvain University, Belgium. The Group elected Dr. Bugher to act as Chairman of the meeting.

2. The Group first studied the general constitutional position, function and responsibilities of WHO, in relation to the programme for international co-operation in developing the peaceful uses of atomic energy, giving special attention to the problems of co-ordination with interested inter-governmental and non-governmental agencies.

3. For the purpose of discussion the Group considered the problems under two categories, those in the field of protection and public health which for the purposes of the discussion the Chairman described as "negative problems", and those concerned with the advancement of knowledge through the use of new tools resulting from nuclear fission, which he described as the "positive problems". The problems discussed are listed below:

Health Protection (negative aspects)

- Standards for protection (International Commission on Radiological Protection, Work and Policy);
- Disposal of radio-active waste material;
- Nuclear reactor safety
- Radiation-induced diseases

The health problems of uranium mining;

Transport of radio-active materials;

Standards for radio-active materials and establishment of units of radio-activity;

WHO responsibilities in the field of protection:

gathering and dissemination of information;
training;
education of the public.

Medical Use and Potentialities of Radio-isotopes (positive aspects)

Food sterilization;

The use of radio-active isotopes in

therapy;
diagnosis;
research -
research concerning human nutrition and agricultural aspects;
epidemiology and control of communicable diseases;

Medical reactors;

Radiation genetics;

Radiography using radio-active isotopes;

WHO responsibilities in the development of constructive programmes:

collection and diffusion of knowledge;
training;
need of a specialist for WHO.

4. HEALTH PROTECTION

4.1 Standards for Protection (International Commission on Radiological Protection, Work and Policy)

It was stated that the International Commission was a purely advisory scientific body attached, for the time being, to the International Congress of Radiology. On the basis of the limited data so far available, it has issued tentative figures for the permissible concentration of radio-active elements in drinking water and environmental air. Its recommendations have no legal standing, but are, in fact, being widely applied.

4.2 Disposal of radio-active waste material

This is an extremely difficult problem which has not so far been definitely solved. Although up to the present time the situation is not alarming, the potential danger may become important when a great number of laboratories throughout the world start operations. In the case of liquid waste, the problem is to reduce it to the smallest possible volume by chemical means for storing in containers. More bulky solid waste could be disposed on the sea-bed without danger of contamination of the surface. The situation is more difficult in regard to reactors with no direct access to the sea which depend on rivers for disposal. In such cases the water of the river should be kept at below one-tenth of the permissible degree of contamination of drinking water. A great deal of research is being done on means for the economic use of waste products which will reduce the cost of disposal.

As regards fisheries, it was stated that experiments were going on to determine the concentration of radio-activity in fish, including spawn and fry, living in water contaminated by waste material from atomic energy plants. Although the degree of radio-activity found gave no cause for alarm, constant watch is necessary, also of seaweed which might be used for human consumption.

4.3 Nuclear reactors safety

The danger for the general population resulting from accidents in a reactor could be minimized by installing the reactors far away from centres of population. Danger to agriculture should also be taken into consideration. The most probable kind of accident would be fire resulting in radio-active elements becoming airborne. This is a risk common, in different degrees, to all types of reactors. From the WHO point of view, preventive measures against this risk would be of great importance at the planning stage, especially in countries wishing to start participating in atomic activities.

4.4 Radiation - induced diseases

Chronic effects of exposure to low levels of radiation can produce disorders of the blood-forming tissues. Exposure at the borderline of the

permissible dose might result in an increased incidence of leukaemia. Local over-radiation for therapeutic purposes increases the probability of malignant growth after 10-20 years. Acute over-exposure to high levels of radiation commonly produces cataract, although after a peak effect, there is some degree of regression. There is no evidence of any permanent decline in fertility or of genetic changes. There is some evidence of higher mortality rates among persons acutely exposed to radiations in bombed cities of Japan. It was stated that radiologists are continuously exposed to far greater radiation than scientists using radio-isotopes, so that there was some inconsistency in concentrating the efforts of protection only in regard to the latter group.

Attention was drawn to protection of human beings in the pre-natal state against unnecessary radiation, and therefore the protection of pregnant women working in radiography against such irradiation should be studied.

4.5 The health problems of uranium mining

There is some evidence that uranium miners have been stricken by lung carcinoma as a result of breathing alpha-emitting materials such as radon and its active deposit on the dust, which tend to be present in high quantities in the air if the mines are not properly ventilated. Nevertheless, it is difficult to draw any definite conclusions, since some metals, such as nickel and cobalt, are also present. Proper ventilation and drilling systems are essential in these mines.

4.6 Transport of radio-active materials

Uranium 235, plutonium and uranium ore are the critical materials required for transportation to or from the atomic energy plants. The main risk is fire, but the danger of irradiation for the personnel handling this material is also important. Another important problem is that of transport of radio-isotopes. In the UK radio-active substances are not allowed to be sent by post. In the USA, a material which can be placed next to a photographic film for 12 hours without damage to the film is accepted for air transport, and it can be accepted that its radio-activity is well within the limits of safety to a person's health. Such materials are always properly

packed in an adequate container and, in normal conditions, their danger is not too high, but the question of delays in transport and of accidents has to be considered. It should consider this subject for international discussion.

4.7 Standards for radio-active material and establishment of units of radio-activity

This is a question which has still not been satisfactorily answered, and it is a problem that comes within the province of physicists. WHO might play a part in the collection, collation and diffusion of information. A problem of technique which raises considerable difficulties is that of measuring the irradiation to which human beings might have been subjected. Biologists generally measure such irradiation in terms of ionization, but there are some levels of energy at which ionization might play only a minor part.

4.8 WHO responsibilities in the field of protection

4.8.1 Gathering and dissemination of information. In addition to the bibliographies of material generally available, the US Atomic Energy Commission has a considerable number of unpublished reports, the titles of which can be supplied to WHO to act as a clearing-house to serve interested countries.

On the other hand, the International Commission on Radiological Protection has a number of reports and valuable information, for the publication of which great difficulty is encountered. Some of these reports will be of interest to WHO which could give them the appropriate publicity.

4.8.2 Training. The training of public health physicians in the field of occupational health and safety is one of the most difficult, since practical training could be gained only in plants located where, for obvious reasons, foreign students may not have easy access.

4.8.3 Education of the public. The experience in different countries has been that in the communities near nuclear energy plants people are not greatly concerned, since they can see for themselves that there are not great dangers.

The action of WHO would be of best advantage in those communities which have no experience in this field. There is a real need for preventive education of the public in order to circumvent resistance due to ignorance.

5. MEDICAL USE AND POTENTIALITIES OF RADIO-ISOTOPES

5.1 Sterilization of food and pharmaceutical preparations

Successful experiments have already been carried out to irradiate potatoes with gamma rays, so as to inhibit sprouting, although the sterilization of large quantities of food might constitute considerable practical difficulties. Furthermore, the danger of food acquiring carcinogenic properties must be carefully investigated.

Sterilization of pharmaceutical preparations, which could not be subjected to high temperatures, such as catgut, should also be examined.

5.2 The use of radio-active isotopes in -

5.2.1 Therapy. Radio-active isotopes have been used in treatment - usually as palliatives - for many years but their use has recently increased. Work with them should be confined to certain centres and groups and spectacular results should not be expected. Attention was also drawn to a mechanism using cobalt-60, which could replace high voltage X-ray machines to advantage. Training in the use of cobalt-60 machines of persons from technically underdeveloped countries might be considered, but it should not be forgotten that WHO would have to study carefully applications for fellowships.

5.2.2 Diagnosis. It was pointed out that tracers should not be used for diagnostic purposes, unless really necessary. There are a few accepted diagnostic tests with radio-active material but it should be kept in mind that there is still some doubt as to its influence on genetics. The emphasis should, for the time being, certainly fall on research.

5.2.3 Radiographic machines of small dimensions. It was mentioned that small X-ray machines for diagnostic purposes have been devised using radioactive thulium, together with a polaroid quick-developing unit. These machines are most convenient for use in the field when electrical power is not readily available, but could not, of course, replace proper X-ray equipment in hospitals.

5.2.4 Research. The field open to Research is very wide. As regards agriculture, nuclear radiation is already being applied in genetics for the

acceleration of nutrition processes in plants for the development of strains which are highly resistant to disease. Much more knowledge is needed, especially in tropical countries, on molecular movement in soils and on the intake by plants through roots and leaves. Instructive information has already been obtained on the value of different methods of fertilization. With regard to epidemiology, great stress was laid on the importance of the study of the behaviour of animals which might act as vectors in the propagation of human disease, such as insects, rats, etc., by "tagging" them with radio-active material.

5.3 Medical reactors

Small atomic reactors as reliable sources of radiation may be useful for purposes of research in biology. The importance of the pooling of resources wherever necessary was stressed.

5.4 Radiation genetics

Radiation in the field of genetics has been studied in animals (fruit-fly) and plants such as oats and maize, so as to produce strains giving a greater yield. As regards viruses, experiments have been made with influenza virus, so as to produce mutants which may give a polyvalent vaccine. Work has also been done in embryology, to learn about the maturation of certain parts of the embryo. The necessity for doing much more work in these fields was pointed out.

5.5 WHO responsibilities in the development of constructive programmes

5.5.1 Collection and diffusion of knowledge. It was agreed that WHO should not try to set up a library of relevant literature but could play an important part in stimulating the flow of information on the medical use of radio-active substances. The manner in which such information could be collected requires further study but it was pointed out that symposia had been held at Oxford in 1951 and 1954 and that the discussions had been published. Furthermore, the Atomic Energy Commission of the United States had published a

bibliography which could be brought up to date from scientific abstracts. It was also stated that the International Commission on Radiological Units had a number of reports available. The Atomic Energy Commission of the United States also had a considerable number of unpublished reports which could be put at the disposal of those requiring the information contained therein, the WHO acting as clearing-house. It was also suggested that the WHO publish a monograph on the possible uses of atomic energy in medicine and public health, prepared in a condensed form by a group of specialists and which would have the advantage of being published in two or three languages.

5.5.2 Training. Several ways of training personnel in the medical use of radio-isotopes were discussed.

(a) Fellowships. These should be of the post-graduate type. Only in very exceptional cases might undergraduates be considered. Fellows to be selected from different categories, such as physicians, biophysicists, engineers, etc.

(b) Consultants on various techniques to be sent to countries. Availability of suitable persons might be a source of difficulty.

(c) Substantive scientists to visit different centres of learning.

(d) Exchange of research workers.

(e) Advanced short courses for specialists from different countries.

5.5.3 Need of a specialist for WHO. The need for WHO to have a specialist of its own was stressed, and it was pointed out that this specialist would, of necessity, maintain broad contacts with institutions dealing with the medical application of atomic energy.

6. [illegible]

6.1 The Group, summing up its views about priorities for WHO action, agreed that first priority should be given to protection in its two aspects: first, the protection of those working with radiation, and, secondly, the public health

protection of the community. This should be done by the collection of the relevant information and its dissemination by means of an appropriate publication and by assisting countries in the training of appropriate personnel in methods of protection.

6.2 The Group wished to emphasize that WHO had an immediate responsibility for drawing the attention of governments to the urgent need for considering health aspects of atomic energy programmes, in the early planning stage. It was felt that the International Conference on the Peaceful Uses of Atomic Energy and the Advisory Committee established by the General Assembly of the United Nations to prepare for the Conference were the appropriate forums for sounding that warning.

6.3 On the positive side it was agreed that WHO had an important role to play in stimulating the flow of information. Its long-term activity should be to encourage and facilitate the exchange of scientific knowledge and to assist countries in providing the appropriate training for all categories of personnel required for the application of techniques using atomic energy in the various fields of medicine and public health. To perform these various functions the Group agreed that it would be necessary for WHO to have a specialist of its own in the medico-biological aspects of atomic energy.