

IRPA 10

TOPICAL SESSIONS Reports of Co-Chairmen for Highlight Sessions

T-1: Radiological Protection of Humans and Biota in the Environment Monday, 15 May 2000

Chair and Keynote: R. Alexakhin

Co-Chair: P. Strand

R. Alexakhin gave an overview of ICRP principles for radiation protection and addressed those relevant for environmental protection. The main focus of the session was however on the protection of the environment itself. All the presentations stressed that the current basis of the protection strategy is far from sufficient. The ICRP environmental statement which states that *if man is adequately protected then other living things are also likely to be sufficiently protected* has been the basis of environmental protection. This statement is based on a belief, is not documented, and it may not always be true. There is therefore a need for a method of assessment of consequences for flora and fauna and a framework for protection. The International Union of Radioecology has for the last 3 years had a Working Group *on doses and effect in non-human systems*. The work of IUR has benefited greatly by the system proposed by R. Pentreath. The IUR working group has worked further on the outline how to deliver such a system for the protection of the environment from radiation and a framework to make it work. P. Strand, General Secretary of IUR and R. Pentreath presented this system and framework.

At the present time effects of radiation on flora and fauna, has been summarised in many reviews (e.g UNSCEAR 1996). However one of the main conclusions to emerge from the IUR Work Group was that a more coherent approach was required with respect to the assessment of doses to biota and the protection of the environment from ionising radiation. Information has not been structured in a suitable way to conduct an Environmental Impact Assessment and it is not easy to use it to assess environmental impacts. A system and framework is required.

The system and framework which was outlined takes into consideration the fact that the behaviour of radioactive matter in an environment represent a very complex system with many species and ecological parameters and an enormous variability.

It was therefore stressed that to develop a coherent and logical environmental impact assessment methodology for ionising radiation, a framework, within which generic organism and reference models can be applied and results analysed, is essential

The framework and system presented included

- the need for a new unit

- reference dosimetric models
- reference environmental geometries
- reference faunal and flora types of organisms
- broad biological endpoints for radioactive effects
- standard methods for calculating exposure and
- basic principles for estimating the consequences for population and ecosystems-

As a result of this work, it was emphasised that it should be possible to define the appropriate level in the biological hierarchy (over the range from cell to ecosystem) at which protective action should be directed.

The choice of reference organisms could ideally be based, amongst others, on criteria such as (a) organisms which, by virtue of environmental transfer and concentration factors, have the greatest potential for exposure, radioecological sensitivity b) organisms which have a high radiosensitivity (c) organisms which are important to the healthy functioning of the ecosystem. But the final choice will probably depend upon more single criteria.

The reference exposure pathways and the reference model to describe it should be based on the acquisition and synthesis of information concerning the characteristics of selected ecosystems, particularly those that could be expected to influence the behavior of radionuclides and their uptake by the biological components. The available information and knowledge of the environmental behavior of radionuclides in the chosen ecosystems, combined with modelling studies should make it possible to develop simple reference models for the simulation of radionuclide migration and uptake to the whole organism (and organs if applicable) for reference species living in representative terrestrial and aquatic ecosystems.

It was stressed by several of the speakers that there is a need to to develop dosimetric units for flora and fauna. Current knowledge only including absorbed dose expressed in grey however there is a need to incorporate the idea of relative biological effectiveness (RBE) for different types of radiation, species and end points and to develop the concept of equivalent dose for flora and fauna.

For effects there is especially a need for quantifying the dose effect relationships for specified endpoints for the flora and fauna. It is proposed to focus on mortality, reproduction, and cytogenetic effects, but also behavioural and immunological effects may be addressed. The chosen end point would influence the development of the dosimetric models.

The effect of acute irradiation on a single simple, closed, self-maintaining ecosystem were examined by M. Doi. The data obtained allowed the development of a computer model, and also to demonstrate that a non-lethal; response in one component species could trigger a lethal response in another. This demonstrated the need for a holistic approach for the environmental protection.

The future need for work in this topic was clearly recognized through the presentations in this session. The International Union of Radioecology has an

ongoing working group on this issue. This is dealing with terminology, identification of knowledge gaps, criteria's, developing the system and framework, and address the need for international consensus. The IUR has provided one report on the issue to the European Commission EC *Doses and effect in non human systems* this year and will in the beginning of next year have a new report on the topic.

The International Atomic Energy Agency has provided a discussion report on *Protection of the environment from the effect of ionizing radiation*, and is planning further work. The need for international cooperation in this issue was stressed, but also the need for research for the development of the system and framework. In that sense it was positive that the EC had addressed this issue in the Fifth Framework with support for the two research project FASSET and EPIC.

ICRP informed during the IRPA conference that also they would look into the issue of protecting the environment and establish a task force during this year.