Report of
High Level and Expert Group
on
European Low Dose Risk Research

Comments by Peter Jacob, 21 November 2008

General comments

The report of the High Level and Expert Group on European Low Dose Risk Research is an important document on the way to an integration and coordination of European low-dose risk research. However, the report focuses too much on single aspects and not enough on the integration of different research areas, especially of radiobiology and epidemiology. Models of carcinogenesis are a possible tool to achieve such a combination for cancer risk estimation. Models of carcinogenesis are, however, not mentioned in the text. Instead, system biology is pushed, which can not solve the problems of radiation protection without a combination with epidemiology.

Specific comments

i) Second paragraph of Chapter 2. The formulation '...low dose (say < 100 mGy or 100 mSv whole body)...' should be supplemented and changed because of several reasons.

First, in other parts of the document exposures of workers are related to low dose. According to the present dose limits, occupational doses may add up to several hundred milligray.

Second, research in the order of (and not only below) 100 mGy has to be performed to link epidemiological results (above 100 mGy) to lower doses. The reason is that doses in the order of 100 mGy mark the range of transition from high dose to low dose effects (as is demonstrated by low-dose hypersensitivity, bystander effects and radiation-induced genomic instability).

Third, the use of 'whole body dose' (not defined by ICRP) and ‘mSv’ (related to effective dose, which is not a useful quantity is risk research) should be avoided.

In summary, I propose to replace the formulation by something like '...low dose (say < 100 mGy). Because of two reasons, research will also be needed for doses in the order of 100 mGy. First, actual dose limits for workers allow life time doses in this dose range. Second, doses in the order of 100 mGy mark the range of transition from high dose to low dose effects (as is demonstrated by low-dose hypersensitivity, bystander effects and radiation-induced genomic instability). Their understanding is needed to link epidemiological data (for higher doses) to the low-dose range.

ii) Chapter 2 is a collection of single research interests. It contains the danger to continue with specialized, not related research issues as it was done in previous framework programmes. Much more weight has to be put on integration of the various aspects and disciplines.

iii) The first paragraph of Section 3.1 mentions four types of dose response forgetting an up-bending dose response, like the linear-quadratic dose response relationship for leukaemia in the low/moderate dose region.

iv) The second last paragraph of Section 3.1 (also Section 3.2) states that a systems biological approach is needed to incorporate biological processes in models of low-dose response. This is certainly correct. However, it is at least equally important to link results of systems biology to epidemiology. At the current stage and also in the foreseeable future, it is not possible to make quantitative risks estimates without epidemiology. Models of carcinogenesis are a possible tool to combine results of systems biology and of conventional radiobiology (which is also certainly needed) with cancer epidemiology.

v) Figure 3 lacks an integrative approach of radiobiology and epidemiology to understand radiation response and quantify cancer risks at low doses from protracted exposures. This activity should be supported from the beginning (starting in 2009).

vi) Section 3.2 to individual variability and genetic susceptibility to cancer: Most projects currently firming under 'genetic susceptibility' are related to high doses. Low/moderate dose should, therefore, be mentioned in the section, which is presently not the case. Feasibility studies have to be performed first here, to see what is possible.

vii) Figure 4: Studies of populations should be fully supported from the beginning (not with small support in the early years as indicated in the figure). Further, an extra field for combining results of mechanistic studies and of studies of populations with models of carcinogenesis should be introduced. These activities have to start from the beginning, because they help to define, which field of system biology/radiobiology are indeed useful for a quantitative estimation of radiation risk.

viii) Figure 5 and Figure 6: An extra field for combining results of mechanistic studies and of studies of populations with models of carcinogenesis should be introduced. See also comment vii).

ix) Figure 9: An extra field for combining results of mechanistic studies and of studies of populations with models of carcinogenesis should be introduced in the time period 2009 to 2015. See also comment vii).