

EUROPEAN PROJECT FOR DEVELOPING GENERAL GUIDELINES FOR HARMONISING INTERNAL DOSE ASSESSMENT PROCEDURES (IDEAS)

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Introduction

Several international intercomparison exercises on intake and internal dose assessments from monitoring data led to the conclusion that the results calculated by different participants varied significantly mainly because of the wide variety of methods and assumptions applied in the assessment procedure. Based on these experiences the need for harmonisation of the procedures has been formulated as an EU research project under the 5th Framework Programme (2001-2005), with the aim of developing general guidelines for standardising assessments of intakes and internal doses. In the IDEAS project eight institutions from seven European countries are participating using inputs also from internal dosimetry professionals from across Europe to ensure broad consensus in the outcome of the project.

Work Programme

The project is divided into Work Packages (WP), one for each of the five major tasks. The structure of the project and the interaction between Work Packages are shown in Figure 1.

Work Package 1 entitled *Collection of incorporation cases* was devoted to the collection of data by means of bibliographic research (survey of the open literature), contacting and collecting data from specific organisations and using information from existing databases on incorporation cases. Two databases (the bibliographic database and the incorporation cases database) were to be prepared and some reference cases for the performance of Work Package 3 selected.

In Work Package 2 (*Preparation of evaluation software*) an existing computer code IMIE [1] was to be used as a platform for testing existing methods and approaches for bioassay data interpretation and methods developed in the project. This software was to be provided to the partners for the evaluation of reference cases. The current version of the computer code IMBA [2] was also made available to the participants to support the evaluation procedures. In this WP, different and new methods of data interpretation are studied and compared, the pilot program unit

of IMIE was developed and tested, and the procedures of input and output data from the incorporation cases database (WP1) implemented.

Work Package 3 deals with the *Evaluation of incorporation cases* by means of the software provided by WP2 and using the reference cases from WP1. Each selected case was to be evaluated by at least two partners. The evaluations are compiled in a database pointing out common assumptions for similar scenarios, applied models and parameters and procedures to assess uncertainties, handling outlying data and measurements below the limit of detection etc..

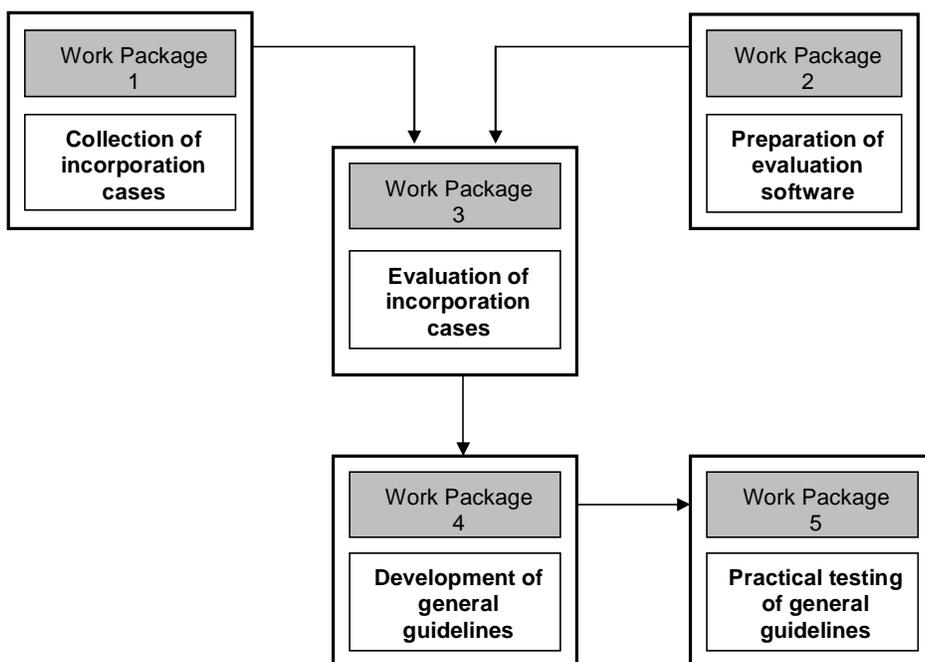


Figure 1. Structure of Work Packages

In Work Package 4, which is the core of the project (*Development of the general guidelines*), the partners derive a common strategy for the evaluation of monitoring data, draft the general guidelines and discuss it with internal dosimetry experts. The discussion will improve the common strategy and permit finalisation of the draft of the general guidelines.

In Work Package 5 (*Practical testing of general guidelines*) the validity of the draft guidelines will be tested by means of a dose assessment intercomparison exercise open to participants from all over the world (4th European Intercomparison Exercise on Internal Dose Assessment). The intercomparison will be prepared, all the participants will receive the guidelines and will be invited to use them during the assessment of incorporation cases.. The organisation of a Workshop (open to all the intercomparison participants), for discussing the results and finalising the report of the intercomparison is also scheduled. The last step of WP5 is the publication of the final version of the general guidelines and their submission to national and international bodies for approval.

State of the project

The programme is running roughly according to the originally planned time schedule. At this time (August 2003) the following achievements can be reported.

Within WP1 two databases have been set up. The first database is a so-called Bibliographic Database, which collects information present in the open literature or in other reports dealing with internal contamination cases. All the participants in the project were involved in obtaining data from these and other sources of information. The structure of the database (BibDb) permits the user to view the database, search it and input new data. At this time more than 500 references have been collected. The references were distributed among the participants for reviewing and commenting on the papers from the point of view of their suitability for internal dose assessment (well documented cases). The selected case descriptions constituted the basis of another database called Internal Contamination Database (IntContDb). Besides the use of BibDb for the purpose of the IDEAS project, it also provides a useful tool for the scientific community interested in internal dosimetry for studying internal contamination cases. The BibDb has been put in a restricted web page presently available to the IDEAS partners only, but it will be made accessible for everybody in the near future.

The second database is the above mentioned Internal Contamination Database. This database has been set up to collate, in a given format, the descriptions of the selected well documented cases (contamination scenarios and follow up measurements). This means that the structure of the IntContDb permits the collection of all the information needed for internal dose assessment i.e. the description of the working area and characteristics of the work, date and modalities of the initiating event, actions taken, physical and chemical characteristics of the contaminant, etc.. For each contamination case, the participating partners entered the available information and monitoring data into a structured spreadsheet file for transfer into the database. Currently this database contains more than 200 cases. At present the IntContDb is accessible to the IDEAS partners only, but later will also be available on the web to others.

The IMIE (Individual Monitoring of the Internal Exposure) computer code was chosen for evaluation of the selected reference case studies. IMIE was developed for the purposes of retrospective dosimetry. It gives to the dosimetrist a very good tool for the analysis and interpretation of multiple bioassay measurements. IMIE helps the assessor to make estimations about a history of intakes and corresponding doses on the basis of individual monitoring data. In particular it permits the user to review and compare the possible variants of exposure condition combinations and to select the degree of automation from fully automated to completely manual regimes. Within WP2 the IMIE code has been improved and fitted to the special requirements of the IDEAS project. For instance during the course of WP2 a new optimisation algorithm of numerical deconvolution of monitoring data has been developed and a new probabilistic algorithm based on statistical methods has also been introduced. The final aim of WP2 has thus been achieved, namely to provide the participants a useful and flexible tool for the dose evaluation process of WP3.

After constructing the databases in WP1 and the upgraded IMIE code in WP2, the evaluation and analysis of the selected well documented cases was carried out in accordance with the scheduled work program of WP3. For this purpose 67 cases covering different circumstances and 16 radionuclides were selected from the IntContDb and distributed among the partners for detailed evaluation. The selected cases were evaluated using the IMIE and IMBA-Expert codes using different assumptions and making relevant comments. The best estimate for the calculated intake and committed effective dose were given in each case, together with notes on important issues related to the guidelines. The results were presented as MS Word documents and in

condensed version in Excel files in a given format and were collected in the evaluation database (EvalDb) established for this purpose. Up to now 75 independent evaluations on 42 cases have been collected in the database. The EvalDb provides possibilities, among others, to view the results of evaluations, to search within the database according to different aspects, to compare different evaluations on the same case and has links to the IntContDb. The results of the case evaluations have been discussed by the partners from many aspects (data fitting, uncertainties of data, intake patterns and model parameters, preferred monitoring types, handling of monitored data, etc.) and lessons drawn from the point of view of the guidelines to be prepared.

The tasks planned for WP4 have also been started by the preparation of the first outline of the IDEAS Guidelines Document that will harmonise with the corresponding ICRP document under preparation [3]. The draft of the IDEAS Guidelines is expected to be prepared by the end of 2003 and distributed for comments by means of a so-called Virtual Workshop to as many experts involved in internal dosimetry as possible all over the world. The Guidelines and the databases established in the IDEAS project will be put in the web page of the IDEAS project accessible to everybody, the address of which is for the time being

<http://hikwww2.fzk.de/hs/strahlenschutz/IDEAS/default.htm>

Comments will be invited and also posted on the Virtual Workshop web page up to the middle of March 2004. The comments will then be discussed by the consortium and a revised draft of the Guidelines prepared considering the outcome of the Virtual Workshop.

As scheduled in WP5 the validation of the Guidelines will be done through an intercomparison exercise, planned to be completed by the end of 2004, and followed by another Workshop to draw the final conclusions on the use of the draft Guidelines and to enable preparation of its final version.

Co-operations

During the work of the IDEAS project close co-operation has been established with other EU projects (especially OMINEX [4]) and ICRP programs (Working Party on Bioassay Interpretation [3], Task Group on Internal Dosimetry, INDOS).

References

- [1] Berkovski, V (2000). Application of the internal dosimetry support system for interpretation of in vivo and bioassay measurements. *Radiat Prot Dosim* Vol 89, Nos 3-4, p. 271.
- [2] Birchall A, Puncher M, Marsh JW, et al (2002). IMBA-EXPERT: internal dosimetry made simple. Presented at the Workshop on Internal Dosimetry of Radionuclides: Occupational, Public and Medical Exposure, Oxford, 9–12 September 2002. *Radiat Prot Dosim* (in press).
- [3] Fry FA, Lipsztein JL and Birchall A (2002). The ICRP Working Party on Bioassay Interpretation. Presented at the Workshop on Internal Dosimetry of Radionuclides: Occupational, Public and Medical Exposure, Oxford, 9–12 September 2002. *Radiat Prot Dosim* (in press).
- [4] Etherington G, Stradling GN, Rahola T, et al (2002). Design and implementation of monitoring programmes for internal exposure (Project OMINEX). Presented at the Workshop on Internal Dosimetry of Radionuclides: Occupational, Public and Medical Exposure, Oxford, 9–12 September 2002. *Radiat Prot Dosim* (in press).