The IAEA's Programme on Environmental Modelling for RAdiation Safety (EMRAS II)

EMRAS II
Reference Approaches for Biota Dose Assessment
Working Group 5
"Wildlife Transfer Coefficient" Handbook

M I N U T E S

of the 2nd Working Group Meeting
held as part of the Joint EMRAS II Working Group Meetings (WG4, WG5 & WG6)
at IAEA Headquarters, Vienna
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IAEA Scientific Secretary	Working Group Leader
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Meeting objective

The aim of the meeting was to discuss relevant data largely from terrestrial ecosystems which will be used to provide concentration ratios for the Technical Reports Series (TRS) Handbook on Transfer of Radionuclides to Wildlife and the ICRP Committee 5 (C5) Transfer Report for Reference Animals and Plants. A further objective was to consider different options for approaches that might be recommended in the TRS to provide guidance on how to fill data gaps.

Meeting plan

Brenda Howard gave an introduction to the Transfer Handbook and the association with the EMRAS II WG 5 on Transfer. There followed a series of presentations (see the Meeting Agenda below) on the potentially relevant data that each participant may be able to input into the online database and generic approaches.

Online database

The online database constructed by the Environment Agency (EA) in the UK was demonstrated and described by Laura Newsome. The data used in ERICA have been reformatted, QC'd and input into the database for marine and terrestrial ecosystems. The freshwater database from the ERICA Tool still needs some further clarification before it is put into the online database. The current status of the database was discussed. Summary tables are occasionally incorrect and some bugs were identified. EA will attempt to address these problems as soon as possible. A list of issues to be addressed was agreed with EA during the meeting.

1. Consideration of CR datasets

Some substantial datasets are being prepared for entry into the database from a number of countries for both terrestrial and aquatic ecosystems. The data arise from: (i) substantial reviews of national datasets (e.g., Canada, Russia, Finland); (ii) collations of data from specific site studies (e.g., France, Australia, Sweden, Serbia, UK, Japan, Ukraine); (iii) reviews of transfer to a particular species or organism (e.g., reptiles); and (iii) recent or ongoing studies with provisional results described at the meeting (USA, Asian countries, Ukraine). The source of contamination varies and includes uranium mines, global fallout, regulated releases and accidents. Associated actions required to ensure timely entry of the data into the database are given in the Action List below.

2. Generic

A series of interesting presentations were made on possible approaches to filling data gaps using generic methods for both plants and animals. The methods described are potentially useful both for the ICRP and the TRS. Nick Beresford and Kathy Higley outlined the generic approaches currently used for gap filling and those being considered for the TRS. Kathy also described an ongoing study at Oregon State University (OSU) comparing transfer to a wide range of plant species from a small forested area. The data will be extended further and reported in November.

The phlyogenetic approach to consideration of transfer of elements to plants was outlined and a paper will be produced which makes the approach and available data more directly usable for reference in the TRS. Relevant aquatic plant data are available from Australia. There may be potential to extend the approach to freshwater fish using Canadian data. The approach is complimentary to that previously outlined by Ross Jeffree of the IAEA Marine Environment Laboratory (MEL) in Monaco.

Keiko Tagami presented some data showing a correlation between stable element concentration in agricultural products and conifer needles, and asked whether this might be the basis for a potential generic approach for plants of using agricultural data for extensive species. There was agreement to pursue this further by testing the hypothesis with other relevant datasets.

The Bayesian approach described by Facilia (Sweden) was felt to be worth exploring further although it was more relevant to the ICRP report and was unlikely to be useful in providing values within the TRS, in particular by looking at how the methods described could be applied using an example.

Tamara Yankovitch has been compiling data on the internal partitioning of elements in biota to facilitate conversion of tissue specific data to whole body values. This would enable the use of CR values for edible tissues from monitoring programmes designed to assess radionuclide transfer to humans. We agreed that for the special issue she will focus on animals and a selected range of tissues (muscle, liver, bone, gonads (including eggs, foetus)).

3. Other issues discussed

Kd values

The core Handbook Group had previously agreed to focus only on deriving revised CR values for the handbook and the ICRP RAPs. With regard to Kd values, it had been envisaged that previous IAEA TRS's and the ERICA Tool values would be referred to. However, further consideration of ERICA data has shown that some Kd values for freshwater are based on marine data. It was agreed that it is necessary to find out if there are more suitable data available that might be reported in the Handbook for freshwater ecosystems. The TRS (and associated TECDOC) revision considered a limited range of radionuclides, so there is likely to be additional sources. There were large differences between the revised TRS and TRS-364 values – we need to document why and discuss. Brenda will explore alternate sources and summarise the issue for the November meeting and discuss further with Sergey Fesenko.

Data gaps

Data gaps specified in the ERICA special issue papers need to be considered further and key gaps identified associated with different sources or drivers for assessment. Then potential data sources or experiments can be explored with interested Member States.

LOD values

Many datasets have less than values and the current suggested approach in the database help file is possibly not adequate (e.g., divide LOD by 2) compared with the current position in other research areas such as medical statistics (cf Kaplan & Meier) – there are methods available in stats packages and an Excel spreadsheet. The meeting discussed whether we should adopt this type of approach. If we change the recommended procedure we need to decide fast as data are being compiled by a variety of organisations. It was agreed that although this was a useful idea, there was literature available to suggest that within the likely dataset sizes and percentage of non-detects, which would be available, that the LOD/2 approach gave a mean estimate similar to the application of the Kaplan & Meier method. Therefore, the decision was made, for pragmatic reasons, not to change the guidelines at this stage. It was agreed to ask EA if a new data entry field, to identify data which has been modified, might be possible for future capability to address this issue. We could amend the help file to discuss these methods but not be definitive that they should be used, i.e., let contributors choose to use LOD/2 or the Kaplan methodology.

Special issue

Papers based on some of the presentations from the Monaco and Vienna meetings will be published in an issue of Radiation Environment Biophysics. Those people who have said they would like to submit a paper (see the table below) need to confirm that they will be in a position to submit by the end of November 2009. When doing so, they should provide an approximate title and name the first author so that Nick can supply this information to the journal editors.

Lead author(s)*	Paper topic**
K. Higley	Overview of generic approaches
N. Willey	Can angiosperm phylogeny help used to predict plant CRs?
T. Yankovich	Tissue:Wholebody conversion factors
K. Tagami	Can crop data be applied to wild species?
S.Ushida/H. Takata	Estuarine transfer database
M.Wood	Review of reptile CR values
S. Gaschak	Radioecological study of bats
M. Johansen/J. Twining	Australian CR database
B.J. Howard	Transfer to ducks & owls
S. Dragović	Transfer of radionuclides to ants, mosses and lichens
E. Fesenko/S. Fesenko	Russian language freshwater transfer data

*Please confirm the first author to Nick.

**Please provide approximate title to Nick.

Meetings

The next meeting of the group considering the Preparation of the Transfer Handbook will be in Ottawa in Canada during the week of 16–20 November 2009 and will be hosted by the Canadian Nuclear Safety Commission (CNSC). CEH will briefly report the outcome of both meetings of the EMRAS WG 5. The first two days will be a data discussion meeting with presentations. The last three days will be a TRS drafting session by the Core Group.

The next meeting of the EMRAS II WG5 will be held during the Second EMRAS II Technical Meeting (TM), being held at IAEA Headquarters in Vienna, 25–29 January 2010, and will discuss data input and the TRS draft.

Meeting Summary

The status of the TRS, agreed with participants, was summarised by Diego Telleria as follows:

— the November meeting is confirmed and contact with the CSNC has commenced;

— the contributions of EMRAS II WG5 participants is likely to lead to substantial improvements in available data on CR for biota that can then be reported in the TRS;

— ICRP will use the database for deriving CR values for the RAP transfer report;

— the first draft text of the TRS will be prepared in November, it will be sent to the members of EMRAS II WG5 for comment at least 1 week before the EMRAS II TM takes place in January 2010. Discussion of the draft will be a major agenda item during the meeting;

— revisions and final peer review will occur during the first half of 2010 and the final draft should be ready by the end June 2010; and

— the online database will be maintained after the finalisation of the TRS to provide constant updating of CR values thereafter.

Brenda thanked all participants for their valuable contributions and willingness to contribute the discussions. She felt that the meeting had made significant progress in compiling and analyzing data which will be included in the production of the TRS.

Action list (combines Vienna meeting and outstanding Monaco meeting items)

Topic	Action	Responsible organization	Action deadline
Online database	Implement identified corrections	EA	Most by end Sept 09
Freshwater ERICA database	Provide information on which data were used and value of n for entries Agree how we go forward.	STUK Areva, CEH	15th August 2009 Within two weeks of above deadline
Canada	*Input relevant data from various sources, including for sediment – assistance from industry*	*CNSC*	*Some input by end summer 09, remaining one week before EMRAS II Jan 2010 meeting*
	Obtain formal agreement to input data already collated from COG	AREVA	By end August
	Identify relevant data from other Canadian sources, reformat	AREVA CEH/EA to assist with formatting	For discussion in Nov meeting
Russian language	Improve and QC large Russian datasets for freshwater+marine, forest, tundra+meadows	RIARAE	End October 09
Finland (and Baltic)	*CR to fish for Cs and Sr for Baltic sea acquired from Germany* *New CR fw data for Po, Pb, Cs, Sr* *Can also calculate extra CR from Helcom-Mors DB for biota in Baltic Sea*	*STUK will add to estuaries DB* *STUK to add* *STUK*	*(Aug/Sept)* *end Sept* *end Sep*

Topic	Action	Responsible organization	Action deadline
France	*Check availability of aquatic data, including kd values, with colleagues and EDF*	*IRSN*	*End Sep 09*
Australia	The identified data needs further checking and entry into DB	ANSTO	End Oct 09
Sweden	*Input CR mean and error values from SKB data on all three ecosystems after suitable conversion*	*Facilia for SKB* *NAB to inquire re progress*	*Some input by July 09 meeting* *End July 2009*
Serbia	Additional ant and moss data to be put into database	IANE	End Aug 09
UK	Sand dune data input to database	LU	End Sept 09
Japan	NAB to liase re minor comments	CEH, NIRS	Sept 09
Chernobyl – bird, bat, rodent study (as presented by NAB)	Finalise paper submission and input data into database	CEH, CCNSRWR	Nov 09
Chernobyl rodent & frog Pu-data	Enter data to database	UMB	Nov 09
Chernobyl bat study Reptile review	Sample and data analysis continuing – prepare special issue paper and input data to database. Reptiles – liaise with ANSTO re additional data; enter data to database	CCNSRWR, CEH, LU, ANSTO	Nov 09 Sep 09
Oregon forest study	Collate data	OU	For Nov 09 meeting
Central Asian data	Data on U mining sites being collated	UMB to advise	October 09
Ukraine	Chernobyl – possible data from study with Georgia Univ, USA	CEH, CCNSRWR to contact and explore possible data usage	End Nov
Phylogeny	may be able to extend to FW using Canadian fish data Compile and send relevant aquatic plant data from Australia	UWE and AREVA NW to explore fish data ANSTO	End October End October
Use of agricultural plant data	NIRS approach needs further testing , discuss further in next EMRAS meeting	– TY, botanic data – NIRS, UMB?? Chernobyl zone data – SG, CEH, NW may also be able to test	Jan 2010
Bayesian	Demonstration of application of approaches suggested with actual data	CEH to offer to compile example data - discuss with NRPA	End July 2009

Topic	Action	Responsible organization	Action deadline
Internal partitioning	extra input requested on tissue specific to whole body conversion from	all other participants and AREVA to compile	by end Sept
Kd	Need to explore alternate sources and summarise the issue for Nov meeting and discuss further with SF. Consider providing revised tables in handbook	CEH + ANL to locate possible additional fw Kd data value sources.	End Oct 09
Data gaps	Identify potential expts to fill key data gaps for marine ecosystems gaps on basis of table in Erica papers.	CEH, NRPA, Mel	End August 09
	Data mine Mel expt and field data for relevant CR values	Mel	End Sep 09
	Consider suitability of using similar radionuclide substitute data	Mel and CEH	End Sep 09
LOD	Find out if a new data entry field to identify data which has been modified might be possible – can we do at this stage	CEH and EA to discuss	By end July 09 Done – such structural modification not possible at this stage (data manipulation is already a required input to the 'Notes' box)
Guidance for sampling and sample preparation	Check what is available in ICRU report	CEH	By Jan 2010
REB issue	Send NAB confirmation of intent to submit paper together with draft title and first author Provide information to REB Confirm details of paper submission to all authors Prepare papers for submission. (20 pp, 12pt, 1.5 line space).	All lead authors NAB NAB	15th Aug 2009 End Aug 2009 End Sept. By end Nov 09
November handbook meeting	Prepare meeting plans and inform relevant parties in Americas	CEH, IAEA, CSNC, OSU, NRPA	Sept 09

WG5 MEETING AGENDA		
Wednesday, 22 July 2009		
09:00	Welcome & introductions	
09:15	Overview, update and workshop objectives	Brenda Howard
10:00	On-line database	Laura Newsome
	Coffee 10:30–11:00	
11:00	ERICA terrestrial database	Nick Beresford
11:30	Transfer of radionuclides to invertebrates & small mammals in a coastal sand dune ecosystem – and test of database entry	Mike Wood
	Presentations and discussions of novel data/compilations	
12:00	Available transfer data for Australian wildlife	John Twining
	Lunch 12:30–13:30	
13:30	Transfer of radionuclides to reptiles	Mike Wood
14:00	The transfer of Po, U and Ra to wildlife at Central Asian mining sites	Deborah Oughton
14:30	Concentration ratios for two species of birds	Brenda Howard
	Coffee 15:00–15:30	
15:00	Review of Russian language studies on radionuclide behaviour in the terrestrial and aquatic environments: database	Maria Shishulina, Anna Muzalevskaya & Evgenia Fesenko
16:15	CR data for mosses, lichens and ants	Snezana Dragovic
16:45	Close	
Thursday, 23 July 2009		
09:00	Comparative transfer of radionuclides (Pu, Sr & Cs) to species of birds, bats and rodents at a site in the Chernobyl exclusion zone Transfer of Pu to rodent and frog species in the Chernobyl exclusion zone	Nick Beresford Debbie Oughton
09:45	The transfer of radionuclides to bats	Sergiy Gashchak
10:15	Overview of data available from the Candu Operators Group (COG)	Tamara Yankovich
	Coffee 10:45–11:15	
10:45	Entry of data into database	As appropriate
	Methods to fill data gaps – presentations and discussion	
13:30	Overview of what is currently done & intentions for TRS	Nick Beresford
13:50	Generic approaches – an overview	Kathy Higley
	Coffee 15:00–15:30	
15:30	Transfer of stable and naturally occurring elements from soil to edible parts of crops – are such data useful?	Shigeo Uchida/Keiko Tagami
15:45	Application of Bayesian statistics to help fill data gaps/use small datasets	Kristofer Stenberg
16:15	Internal Partitioning of Elements in Biota	Tamara Yankovich
16:30	Discussion of approaches to fill data gaps	All participants
17:00	Close	
Friday, 24 July 2009		
09:00	Summary of workshop – findings and actions; timetable for database activities, TRS production etc. Publication in Radiation & Environmental Biophysics	Brenda Howard
11:00	Entry of data into database	As appropriate
13:00	Close workshop	

List of Participants	
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