

EXERCISE 2: Evaluation of Concentrations Predicted by Models

Aim

To compare the activity concentrations derived from media to biota transfer for the radioecological components of the models under evaluation. To evaluate the underpinning assumptions that may be used in the different models if any activity concentrations are significantly different.

Description

Participants use their models to determine the whole body fresh weight activity concentrations of 18 radionuclides in seven terrestrial and twelve aquatic reference organisms (see Tables 1 and 2). These have been selected on the basis of common radionuclides and reference organisms between the models although it is likely that results will not be returned for all combinations for every model.

Proposed models

RESRAD-BIOTA

England & Wales Environment Agency

ERICA-FASSET

ECOMOD

Atomic Energy Canada Ltd. approach

OURSON (freshwater only)

Potential other contributors from Canada – to be confirmed

Linda Kumblad model SKB – to be confirmed

Method

- 1) Input parameters are 1 Bq kg⁻¹ (Soil) 1 Bq l⁻¹ (Water) Bq m⁻³ (Air ³H & ¹⁴C). (NB – input parameter for C-14 and H-3 may vary)
- 2) Results should be reported for the radionuclides listed in Table 1.

Table 1: Radionuclides for use in Exercise 2

Am-241	H-3	Ra-226	U-234
C-14	I-129	Sr-90	U-235
Co-60	I-131	Tc-99	U-238
Cs-134	Po-210	Th-232	
Cs-137	Pu-239	Th-234	

- 3) Results should be reported for the terrestrial reference organisms listed in Table 2 as whole body activity concentration (Bqkg⁻¹ fresh weight).
- 4) Results should be reported for the terrestrial reference organisms listed in Table 3 as whole body activity concentration (Bqkg⁻¹ fresh weight).

Table 2: Terrestrial Reference Organisms

Earthworm (elongated)
Shrub
Herb
Herbivorous Mammal
Carnivorous Mammal
Rodent
Bird egg

Table 3: Freshwater Reference Organisms

Duck
Frog/amphibian
Pelagic fish
Fish egg
Macrophyte (vascular plant)
Phytoplankton
Zooplankton
Benthic Mollusc
Small Benthic Crustacean

Large Benthic Crustacean
Benthic Fish
Aquatic mammal

- 5) Participants are advised that where they do not have a particular reference organism that they should follow their normal procedure for undertaking the assessment. For example, if you would not report it then do not, if you then make appropriate assumptions do so but list the assumptions made in the results spreadsheet (Table 5).
- 6) With the reference organisms if the participant needs to specify a real species to aid the calculations, the participant needs to note which species they have used under each reference organism category, as appropriate.
- 7) If, for the purposes of calculating the activity concentrations in different reference organisms, you need time spent in different environmental compartments then use the occupancy factors specified in Table 4.

Table 4: If required, use the following occupancy factor data for selected reference organisms

Organism	Underground	Shore	Benthic interface	Water	Air
Duck		0.50		0.25	0.25
Frog		0.50		0.50	
Fish egg			1.00		
Pelagic Fish			0.10	0.90	
Benthic Fish			0.90	0.10	
Aquatic Mammal		0.20	0.20	0.60	
	Underground	Soil surface			
Rodent Herbivorous Mammal	0.7 ^A	0.30			0.00
Carnivorous Mammal	0.50 ^A	0.50			0.00
Earthworm (elongated)	0.40 ^A	0.60			0.00
	0.9 ^A	0.10			0.00

^A Assume burrowing depth of 25 cm

Output

The output is fresh weight activity concentration (Bqkg^{-1}) in the different reference organisms and the results should be presented in the results spreadsheet. An example of the format is given in Table 5.

Table 5: Results output structure

Participant											
Model used											
Organism	Am-241	C-14	Co-60	Cs-134	Cs-137	H-3	I-129	I-131	Po-210	Pu-239	Ra-226
Earthworm (elongated)											
Shrub											
Herb											
Herbivorous Mammal											
Carnivorous Mammal											
Rodent											
Bird egg											
Duck											
Frog/amphibian											
Salmonid/Pelagic fish											
Salmonid egg											
Macrophyte (vascular plant)											
Phytoplankton											
Zooplankton											
Benthic Mollusc											
Small Benthic Crustacean											
Large Benthic Crustacean											
Benthic Fish											
Aquatic mammal											

All results should be reported in Bq/kg (fresh weight)

Participant	0
Model used	0

Assumptions used:

Comments:

Problems encountered:

Participant Model used	Am-241	C-14	Co-60	Cs-134	Cs-137	H-3	I-129	I-131	Po-210	Pu-239	Ra-226	Sr-90	Tc-99	Th-232	Th-234	U-234	U-235	U-238	
Organism																			
Earthworm (elongated)																			
Shrub																			
Herb																			
Herbivorous Mammal																			
Carnivorous Mammal																			
Rodent																			
Bird egg																			
Duck																			
Frog/amphibian																			
Salmonid/Pelagic fish																			
Salmonid egg																			
Macrophyte (vascular plant)																			
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Large Benthic Crustacean																			
Benthic Fish																			
Aquatic mammal																			

All results should be reported in Bq/kg (fresh weight)