

Modelling the exposure of wildlife to radiation: key findings and activities of IAEA working groups

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Introduction

- ❖ The IAEA established the *Biota Working Group* (BWG) as part of its *Environmental Modelling for Radiation Safety* (EMRAS) programme in 2004 because both the IAEA and the International Commission on Radiological Protection (ICRP) were addressing environmental protection (i.e. protection of wildlife) within the on-going revisions to the Basic Safety Standards and Recommendations respectively
- ❖ Some countries were already conducting assessments in accordance with national guidelines
- ❖ The BWG was established recognising these developments and the need to improve Member State's capabilities with respect to protection of the environment, the work of the BWG was continued within the IAEA's EMRAS II programme
- ❖ The objective of the MODARIA group is:

“To improve Member State's assessment capabilities for protection of the environment by comparing, improving and validating models being used, or developed, for biota dose assessment as part of the regulatory process”

Scenario testing sites



Beaverlodge area
(U-mining Canada)



Chernobyl
Exclusion Zone



Little Forest (Australian
waste burial area)



Perch Lake
(AECL site, Canada)

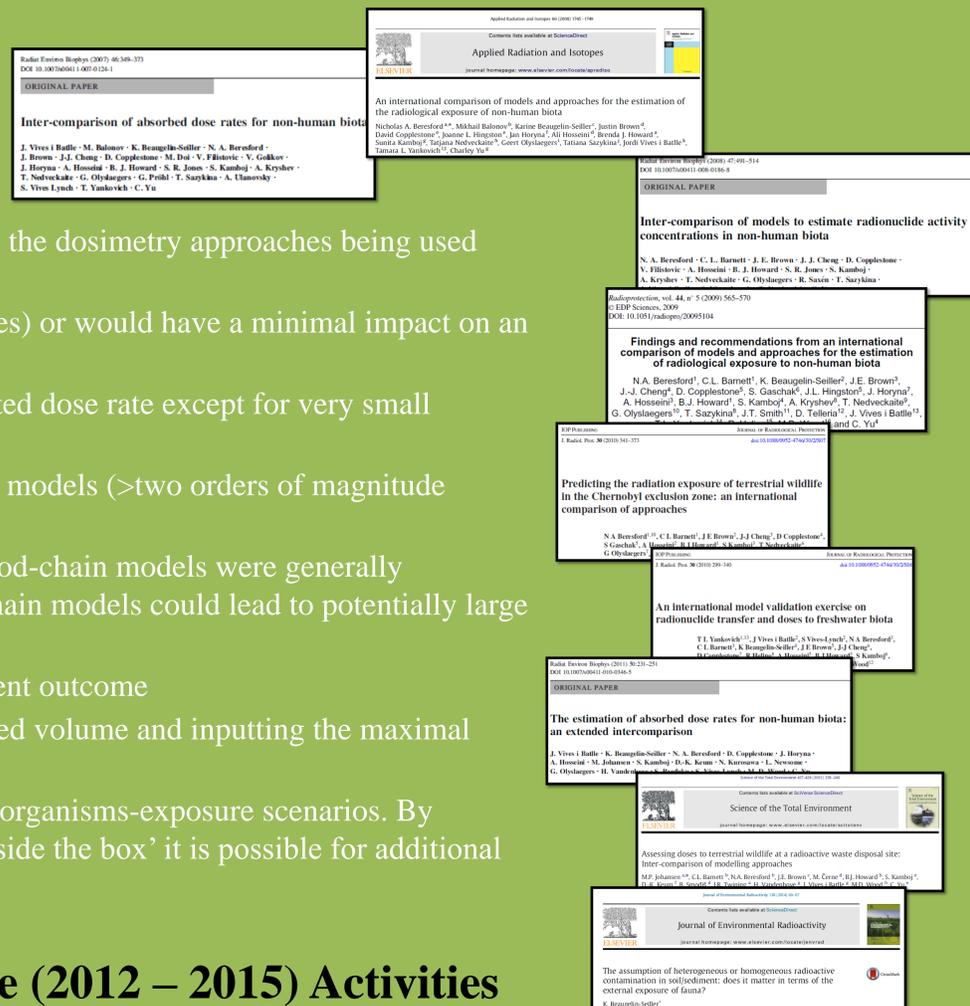


Wetlands

Main findings

Model-model and model-data intercomparisons established that:

- ❖ Assuming unitary activity concentrations in environmental media and organisms, the dosimetry approaches being used generally estimate comparable dose rates
 - Differences can generally be easily understood (e.g. different soil densities) or would have a minimal impact on an assessment (e.g. differences in estimating ³H external dose rates)
 - The assumed mass/size of an organism has little influence on the estimated dose rate except for very small organisms (e.g. fish eggs) and relatively high-energy emissions
- ❖ The estimation of organism activity concentration can be highly variable between models (>two orders of magnitude being common)
- ❖ Predictions of simple concentration ratio based approaches and more complex food-chain models were generally comparable under equilibrium conditions; parameterisation of the diet for food-chain models could lead to potentially large uncertainty
- ❖ Decisions on the how to include decay products can greatly influence an assessment outcome
- ❖ Conservatism is likely to be preserved by assuming a homogeneously contaminated volume and inputting the maximal activity concentration available for any layer
- ❖ The freely available assessment models/approaches consider a limited number of organisms-exposure scenarios. By understanding the main factors influencing the dose calculation and thinking 'outside the box' it is possible for additional exposure scenarios to be modelled



IAEA MODARIA Programme (2012 – 2015) Activities

- ❖ The development of a wildlife biological half-life database which currently contains >1000 entries; the compilation will be made freely available
- ❖ A comparison of dynamic models to predict radionuclide activity concentrations in, and dose rates to, marine organisms. This exercise uses modelled seawater and sediment activity concentrations for the coastal environment near the Fukushima Dai-ichi nuclear complex
- ❖ Assessing if the homogenous ellipsoid geometry assumption made in models used for regulatory purposes is fit for purpose
- ❖ Evaluating if the current assessment approaches conservatively account for spatial heterogeneity in the environment
- ❖ Preparing guidance on conducting assessments based upon the experience of the group during the three IAEA programmes

The group welcomes the involvement of interested participants from IAEA Member States

To register see <http://www-ns.iaea.org/projects/modaria/>

We actively encourage participation by young scientists (including PhD. students) and those wanting to learn about current models

