Addressing current knowledge gaps on radionuclide transfer to reptiles

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Model intercomparison exercises have identified radionuclide transfer predictions as the greatest source of uncertainty in biota dose assessments. In response to this an IAEA Working Group was established to develop an international database of transfer parameters for wildlife. One wildlife group for which few transfer data exist is reptiles.

The parameter used most commonly to predict radionuclide transfer is the CR_{wo}, which is the equilibrium ratio between the radionuclide activity concentration in the whole organism (fresh weight) and that in media (soil (dry weight), water or air). A comprehensive review of published and unpublished international data sets on transfer to reptiles provided CR_{wo} data for 35 elements (Am, As, B, Ba, Ca, Cd, Ce, Cm, Co, Cr, Cs, Cu, Fe, Hg, K, La, Mg, Mn, Mo, Na, Ni, Pb, Po, Pu, Ra, Rb, Sb, Se, Sr, Th, U, V, Y, Zn, Zr) to reptiles in freshwater ecosystems and 15 elements (Am, C, Cs, Cu, K, Mn, Ni, Pb, Po, Pu, Sr, Tc, Th, U, Zn) to reptiles in terrestrial ecosystems (Wood *et al.*, 2010). However, many of these parameters are derived from a single study or data value and there are no data for marine reptiles. Given that reptiles are an important, and often protected, component of many ecosystems and that assessments of radiation impact on ecosystems are becoming increasingly necessary due to the current nuclear renaissance, there is a need to further develop our current database on transfer to reptiles.

The traditional radioecological approach would be to undertake targeted field research in which reptiles and environmental media are sampled destructively and analysed using standard radiometric techniques. However, this is a resource intensive solution and the protected nature of reptiles and the ethics surrounding destructive sampling make it desirable to consider alternatives to the standard destructive sampling approaches. Three approaches that may be used to fill some of the knowledge gaps are: (i) using analysis of non-lethally harvested tissues (e.g. osteoderms, tail tissue, eggs, blood and skin) for estimating whole organism contaminant burdens; (ii) analysis of evolutionary history (phylogenetic) relationships in radionuclide transfer; and (iii) biological scaling relationships (allometry).

This paper presents the current knowledge of radionuclide transfer to reptiles and evaluates the three potential options for addressing our data gaps. In particular, this paper assesses the extent to which the currently available data sets can support the implementation of these three different approaches.

References

Wood MD, Beresford NA, Semenov DV, Yankovich TL, Copplestone D, 2010. Radionuclide transfer to reptiles. Radiation and Environmental Biophysics. DOI: 10.1007/s00411-010-0321-1