

Project: Biokinetic modelling
Client: British Nuclear Group Sellafield Limited

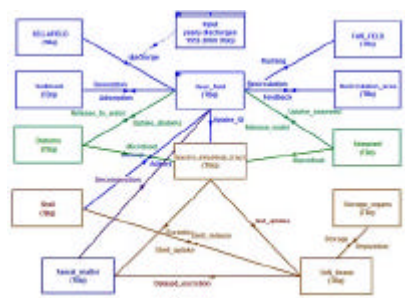
The Challenge

To make assessments of the impact of non-continuous radionuclide discharges on marine biota more realistic by using process-based dynamic models.

Organisms do not respond instantly to changes in discharge regimes - they will accumulate radioactivity whilst discharges are decreasing and will retain it long after discharges have ceased.



Winkles feeding on algae in the laboratory



Biokinetic model for iodine in winkles

The Solution

A range of approaches has been taken to predict future impacts on biota for circumstances where equilibrium cannot be assumed and the usual Concentration Factor based approach to biota dosimetry is not applicable.

Data sourcing

Extensive collection of data from the last few decades for use in constructing biokinetic models & data gap identification.

Uptake experiments

Laboratory uptake experiments on winkles successfully undertaken using iodine and technetium as tracers. Derivation of robust parameters suitable for model development.

Process-based biokinetic modelling

Calibrated and validated models capable of predicting Tc and I uptake and depuration within marine biota, used in conjunction with our marine dispersion modelling expertise, are leading the way towards more realistic assessments.

Allometric modelling

A scaling approach based on allometric functions is being developed to predict radionuclide uptake in biota, with some encouraging results.

The Benefits

Predicting future activities in biota based on non-equilibrium discharges, including future discharge abatement scenarios, is now possible for a suite of organisms and radionuclides.

References

- Olsen, Y.S. and Vives i Batlle, J. (2003). A model for the bioaccumulation of ⁹⁹Tc in lobsters (*Homarus gammarus*) from the West Cumbrian coast. *J. Environ. Radioactivity* **67**(3), 219-33.
- Vives i Batlle, J. *et al.* (2004). Uptake and depuration of ¹³¹I by the edible winkle *Littorina littorea*: Uptake from seawater. *J. Environ. Radioactivity* **78**(1), 51-67.
- Vives i Batlle, J. *et al.* (2005). A biokinetic model for the uptake and release of radioiodine by the edible periwinkle *Littorina littorea*. *Radionuclides in the Environment*, 660 pp. ISBN 0-08-044909-3.
- Wilson, R.C. *et al.* (2005). Uptake and depuration of ¹³¹I from labelled diatoms (*Skeletonema costatum*) to the edible periwinkle (*Littorina littorea*). Proc. II Int. Conf. Radioact. Environ. 2-6 Oct. 2005, Nice, pp. 455-8.
- Wilson, R.C. *et al.* (2005). Uptake and depuration of ¹³¹I by the edible periwinkle *Littorina littorea*: uptake from labelled seaweed (*Chondrus crispus*). *J. Environ. Radioactivity* **80**(3), 259-71.



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