^{14}C AND TRITIUM DYNAMICS IN WILD MAMMALS: A METABOLIC MODEL

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The protection of biota from ionising radiations needs reliable predictions of radionuclide dynamics in wild animals. Data specific for many wild animals – radionuclide combinations is lacking and a number of approaches including allometry have been proposed to address this. However, for ^{14}C and tritium, which are integral components of animals tissues and their diets, a different approach is needed in the absence of experimental data. Here we propose a metabolically based model which can be parameterised predominantly on the basis of published metabolic data.

We begin with a metabolic definition of the ^{14}C and OBT loss rate (assumed to be the same) from the whole body and also specific organs, using available information on field metabolic rate and body composition. The mammalian body is conceptually partitioned into compartments (body water, viscera, adipose, muscle, blood and remainder) and a simple model defined using net maintenance and growth needs of mammals. Intake and excretion, and transfer to body water are modelled using basic metabolic knowledge and published relationships. The model is tested with data from studies using rats and sheep. It provides a reliable prediction for whole body and muscle activity concentrations without the requirement for any calibration specific to ^{3}H and ^{14}C. Predictions from the model for representative wild mammals (as selected to be reference organisms within international programmes) are presented. Potential developments of a metabolic model for birds and the application of our work to human foodchain modelling are also discussed.