BIOKINETICS AND RADIATION DOSIMETRY FOR [4-^{14}C]-CHOLESTEROL IN HUMANS

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Medical and clinical researches utilize radiolabelled cholesterol to obtain information about the physiology of cholesterol and of its several substrates (biliary acids, hormones and vitamins) in the body. The radiotracers constitute a simple and accurate tool for metabolic studies; however, the scientific community has shown certain reservations concerning the use of radioisotopes. Probably, the apprehension is result of the question about the deleterious radiation effects. Although the studies that utilize radioisotopes are approved by strict ethic committees, most of them do not mention the radiometric doses at which the human subjects are exposed during these studies. The International Commission on Radiological Protection (ICRP) provides a generic carbon model (GCM) to calculate the effective dose of compounds labeled with ^{14}C, first described on ICRP publication 30. The effective dose coefficients for most compounds appear to be greatly overestimated by the GCM in comparison with those generated by more realistic models [1]. The GCM cannot be applied to the interpretation of bioassay data with any degree of confidence [1]. The purpose of the present study is to improve the generic biokinetic model [2] for use in the assessment of the internal dose received by human subjects who were administered labelled cholesterol either orally or intravenously. This model was used with the ANACOMP software to estimate the radiometric doses with the MIRD techniques. To validate the model, the simulated profile curves were compared with the profile curves described on the literature (Kruskal-Wallis test, P=0.4232). The model reproduced the intestinal absorption of cholesterol and the excretion of cholesterol in feces and urine. The estimated effective dose coefficient calculated for the reference man described on ICRP publication 23 was 1.35×10^{-11} SvBq^{-1}. The organs that received the highest equivalent dose were the lower large intestine (1.03×10^{-10} GyBq^{-1}), upper large intestine (3.74×10^{-11} GyBq^{-1}) and small intestine (1.58×10^{-11}GyBq^{-1}). The effective dose coefficient calculated by the proposed dosimetric model was approximately forty-three times lower than that which is calculated by the ICRP generic model (5.8×10^{-10} SvBq^{-1}) for ingested ^{14}C that assumes complete absorption to blood.

1. *Taylor DM (2004) Bioknetic models for the behavior of carbon-14 from labelled compounds in the human body: Can a single generic model be justified? Radiation Protection Dosimetry 108;3:187-202*
2. *Manger RP (2011) A generic biokinetic model for cabor-14. Radiation Protection Dosimetry 143;1:42-51*