

XI. Radiopharmaceuticals

Estimations of Absorbed Dose from the Radiopharmaceuticals

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The absorbed doses were calculated in 6 patients for ^{131}I -MAA, in 6 patients for ^{198}Au -colloid and in 6 patients for ^{131}I , by using a method of MIRD (Medical Internal Radiation Dose Committee).

The general equation for the calculation of the average absorbed dose by MIRD's recommendation is;

$$\bar{D}_{(v \leftarrow r)} = \bar{C}_v \sum_i \Delta_i \phi_i(v \leftarrow r) \text{ rad.}$$

where

$D(v \leftarrow r)$ = average absorbed dose to the volume, v , from the source, r . The source has various shapes.

Δ_i = equilibrium absorbed dose constant for radiation of type i with a fractional frequency n_i per disintegration, and a mean energy, $n_i E_i$ in MeV per integration.

$\phi_i(v \leftarrow r)$ = absorbed fraction for the i^{th} type of radiation.

\bar{C}_v = cumulated concentration of activity in volume, v , in $\mu\text{Ci}\cdot\text{hr./g}$.

A Δ_i for each radiation emitted by the nuclide is given by Table in the MIRD's pamphlets.

MIRD's pamphlet gave us the absorbed frac-

tions determined by the Monte Carlo Code.

The activity and the time during which the target is exposed to the radioactive materials were determined by metabolic studies.

Radioactivities in the whole body and critical organs were determined by linear scanning. The total absorbed dose to an organ was estimated by adding the absorbed dose to an organ from the radioactivity in the body other than the organ in interest, to the absorbed dose to an organ from only the radioactivity included in the organ.

In males, the gonadal dose was estimated to be the same as the penetrating radiation component of the total body-absorbed dose. In females, 5 per cent was added to the absorbed dose. Average doses to whole body and lung from ^{131}I -MAA were 0.015 and 1.78 rad. Average doses to the whole body and lung from ^{131}I -MAA were 0.015 and 6.95 rad. Average doses to the whole body and thyroid were 0.025 and 42 rad.

Although MIRD's pamphlet has not been completed, this method of calculation is very helpful in estimating the dose from radiopharmaceuticals, because of its simplicity and reliability.