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Time modeling dependent biodistribution of holmium -166-DOTA-bevecizumab in human by compartment analysis

A R Khorami Moghaddam, A Hakimi and **A R Jalilian**
[1]Radiology department , Allied faculty , Mazandaran University of Medical Sciences
[2]Radiopharmaceutical group , School of Pharmacy , Mazandaran University of Medical Ssciences

Introduction: The main aim of this study was to develop pharmacokinetic model for the colorectal cancer complex 166Ho-DOTA-bevacizumab in normal and tumoral rat to analyze of behavior as a new composition for diagnosis and treatment. The use of compartmental analysis allows a mathematical separation of tissues and organs to determine the concentration of activity in each fraction of interest. Biodistribution studies are expensive and difficult to carry out in humans, but such data can be obtained easily in rodents and rats.

Materials & Methods: We have developed a physiologically based pharmacokinetic model for scaling up activity concentration in each organ vs. time. The mathematical model uses physiological parameters including organ volumes, blood flow rates, and vascular permeabilities. The compartments (organs) are connected anatomically. This allows the use of scale-up techniques to predict new complex distribution in humans in each organ.

Results: The concentration of new complex was measured in various organs at different times. The behavior of the complex (166Ho-DOTA-bevacizumab) was modeled as a function of time in various organs. This data was diagramed as a time function in separated graph for each organ between 2-96 hours after injection.

Conclusion: The variation of integrated uptake in organs is described with summation of 8-10 exponential terms and it approximated experimental data with 1-2 % precision.

ar.khorrami@gmail.com

An implantable *in-vivo* dosimeter for the measurement of delivered dose to patient during radiation therapy

Anas Ismail
Atomic Energy Commission of Syria, Syria

The dose control and related safety of radiotherapy treatments remain a major issue for complex treatments or new procedures. One solution to deal with this technical challenge is the direct and real-time dosimetric monitoring using implantable probes. However, no commercially available implantable in vivo dosimetry nowadays can meet requirements for real-time precise measurements. Implantable MOSFETs cleared by the US FDA for some breast and prostate therapies have drawbacks such as non real-time response, large size, non-extractable and a 4% associated risk of migration. Other in vivo dosimeters such as those based on prompt radioluminescence (RL) of Al2O3:C, also have serious precision limitations due to requirements for non-linear response calibration and periodic optical stimulation to release charge trapped in the material. Recently, a real-time dosimeter with an implantable optical fiber probe has been proposed. The probe incorporates a small GaN (Gallium Nitride) bulk as scintillator to emit prompt radioluminescence (RL) signal under irradiation. This material has a high light yield with linear dosimetric response over a wide dose range. Its RL response has no dose rate dependence. The percentage depth dose (PDD) results were in excellent agreement with those measured with reference to ionization chambers. Its thermal stability and its radiation hardness are also suitable for radiotherapy applications. Moreover, it has interesting properties in terms of biocompatibility and chemical stability. GaN dosimetric system appears as a promising tool for the independent dose verification of complex treatments.

aismail@aec.org.sy