VARIOUS RADIONUCLIDES AND PHARMACEUTICAL FORMS IN THE THERAPY

Környei J, Antalffy M, Baranyai L
Institute of Isotopes Co.Ltd., Budapest, Hungary

The importance of radionuclide therapy was significantly increased in the last years. A large choice of radionuclides with different energies of the emitted particles are available. The low energy conversion and Auger electrons of ^{125}I are absorbed within a distance of 10 nm which is comparable to the cell nucleus. Thus, ^{125}I-labelled oligonucleotides incorporating in the cell nucleus might accomplish combined radionuclide and gene therapy. Energy of the alpha particles coming from ^{211}At, ^{212}Bi or ^{213}Bi are of 5.8-6.1 MeV and being absorbed in a range of 60-70 μm. These radionuclides may be effective in one cell dimension. Local administration of them is preferable. Low energy beta emitters such as ^{117m}Sn, ^{169}Er, ^{177}Lu, ^{131}I and ^{153}Sm may act in a range of 0.2 –0.5 mm, i.e. in some cells dimension. ^{186}Re, ^{89}Sr, ^{32}P, ^{166}Ho are medium-energy beta emitters to be able to treat 10 - 70 cells. On the other hand, the high energy beta emitters like ^{188}Re, ^{90}Y are effective in the range from 100 cells to the dimension of some tissues.

A crucial question of radionuclide therapy: how local and how internal treatment can be provided by open radioisotope preparations. In cell nucleus dimension molecular interactions take place, thus, as pharmaceutical forms, intravenous or local injections containing single molecules should be used. Radio-pharmaceutical localization within the cells or just on the cell surface occurs also with single molecules injected previously, these reactions can be considered as molecular interactions (e.g. ^{131}I-iodide, ^{131}I-MIBG, ^{186}Re/V/-DMSA) or supramolecular interactions between receptors and labelled ligands, antigenes and labelled antibodies as well as enzymes and their appropriate labelled substrates. Molecular interactions may take place also in the extracellular regions, e.g. bone affin agents localize in ion exchange or in chemisorption on the hydroxyapatite. Associated small molecules or large macromolecules are present as real colloid or as larger species in the suspension injections, localizing also in the extracellular region, due to their hindered diffusion. Macroscopic items as radiation sources may act in direct contact with the lesions to be treated, but this technique leads to the brachytherpay (^{103}Pd or ^{125}I seeds in the prostate, ^{106}Ru eye applicator or ^{188}Re-filled ballons in the coronary).