REVIEW

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Targeted molecular imaging in oncology

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Improvement of scintigraphic tumor imaging is extensively determined by the development of more tumor specific radiopharmaceuticals. Thus, to improve the differential diagnosis, prognosis, planning and monitoring of cancer treatment, several functional pharmaceuticals have been developed. Application of molecular targets for cancer imaging, therapy and prevention using generator-produced isotopes is the major focus of ongoing research projects. Radionuclide imaging modalities (positron emission tomography, PET; single photon emission computed tomography, SPECT) are diagnostic cross-sectional imaging techniques that map the location and concentration of radionuclide-labeled radiotracers. ^{99m}Tc- and ^{68}Ga-labeled agents using ethylenedicysteine (EC) as a chelator were synthesized and their potential uses to assess tumor targets were evaluated. ^{99m}Tc ($t_{1/2}$ = 6 hr, 140 keV) is used for SPECT and ^{68}Ga ($t_{1/2}$ = 68 min, 511 keV) for PET. Molecular targets labeled with Tc-99m and Ga-68 can be utilized for prediction of therapeutic response, monitoring tumor response to treatment and differential diagnosis. Molecular targets for oncological research in (1) cell apoptosis, (2) gene and nucleic acid-based approach, (3) angiogenesis (4) tumor hypoxia, and (5) metabolic imaging are discussed. Numerous imaging ligands in these categories have been developed and evaluated in animals and humans. Molecular targets were imaged and their potential to redirect optimal cancer diagnosis and therapeutics were demonstrated.

Key words: ethylenedicysteine, cancer, imaging, technetium-99m, gallium-68