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Imaging Techniques for Evaluation of Drug Distribution in Solid Tumor

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ABSTRACT

Imaging drug distribution inside a tumor is an important tool to support strategies to improve penetration of anticancer drugs and consequently the outcome of chemotherapy. Methods for mapping the distribution of pharmaceutical compounds and their metabolites in situ are of great interest to researchers and to the pharmaceutical industry. There is a particular interest in the distribution of anti-cancer agents within solid tumors. Direct assessment of the distribution of drugs in tumor tissue is technically challenging, and requires the quantification of drug exposure to cells at specific locations relative to blood vessels. The quantification of drugs in plasma, as well as in tissue homogenates, has relied extensively on well-established analytical methods of high-performance liquid chromatography (HPLC) and liquid chromatography–tandem mass spectrometry (LC-MS-MS). In the last 20 years, imaging techniques such as positron emission tomography (PET), magnetic resonance spectroscopy (MRS), mass spectrometry imaging (MSI), fluorescence microscopy (FM), and autoradio-graphy have evolved as powerful tools for the noninvasive study of drug distribution in vivo as well as for studying drug effects at their target sites. In this article, we review the current state of knowledge of the available imaging techniques to measure intratumor drug distribution.

Key words: autoradiography, drug distribution, fluorescence microscopy (FM), magnetic resonance spectroscopy (MRS), mass spectrometry imaging (MSI), positron emission tomography (PET)