Abstract:
The purpose of this study was to assess the feasibility of use of gadophrin-2 to trace intravenously injected human hematopoietic cells in athymic mice, employing magnetic resonance (MR) imaging, optical imaging (OI), and fluorescence microscopy. Mononuclear peripheral blood cells from GCSF-primed patients were labeled with gadophrin-2 (Schering AG, Berlin, Germany), a paramagnetic and fluorescent metalloporphyrin, using established transfection techniques with cationic liposomes. The labeled cells were evaluated in vitro with electron microscopy and inductively coupled plasma atomic emission spectrometry. Then, 1x10(6)-3x10(8) labeled cells were injected into 14 nude Balb/c mice and the in vivo cell distribution was evaluated with MR imaging and OI before and 4, 24, and 48 h after intravenous injection (p.i.). Five additional mice served as controls: three mice were untreated controls and two mice were investigated after injection of unlabeled cells. The contrast agent effect was determined quantitatively for MR imaging by calculating signal-to-noise-ratio (SNR) data. After completion of in vivo imaging studies, fluorescence microscopy of excised organs was performed. Intracellular cytoplasmatic uptake of gadophrin-2 was confirmed by electron microscopy. Spectrometry determined an uptake of 31.56 nmol
Gd per 10(6) cells. After intravenous injection, the distribution of gadophrin-2 labeled cells in nude mice could be visualized by MR, OI, and fluorescence microscopy. At 4 h p.i., the transplanted cells mainly distributed to lung, liver, and spleen, and 24 h p.i. they also distributed to the bone marrow. Fluorescence microscopy confirmed the distribution of gadophrin-2 labeled cells to these target organs. Gadophrin-2 is suited as a bifunctional contrast agent for MR imaging, OI, and fluorescence microscopy and may be used to combine the advantages of each individual imaging modality for in vivo tracking of intravenously injected hematopoietic cells.