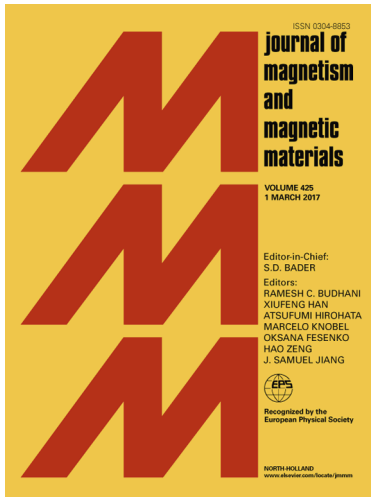

Magnetic drilling enhances intra-nasal transport of particles into rodent brain

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Magnetic drilling enhances intra-nasal transport of particles into rodent brain

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Abstract:

Getting drugs deep into the brain to treat cancers, neurological disease, and behavioral disorders is challenging. In this work, we tried to improve the efficiency of intra-nasal transport into the brain via the cribriform plate using magnetic particles. We and others have used magnetic particles for delivering heat, drugs, and genes. We performed experiments with mouse cadavers that received 250-nm-wide intra-nasal magnetic rods intra-nasally under different combinations of magnetic fields. We found that the application of helical dynamic gradients to the particles (i.e., both rotational and linear) improved transport from the nose into the brain, as compared to linear magnetic gradients alone. On histological examination, no tracks were observed to suggest significant damage to the brain during the transport process. We are currently building a system for testing with live animals, with eventual proposed application to humans.

Keywords:

Nasal delivery; Magnetic drug delivery; Magnetic rods; Brain.

Introduction:

In normal circumstances, the blood-brain barrier (BBB) provides natural protection to the central nervous system (CNS) against noxious substances found in the body's circulatory system. When the introduction of exogenous material into the brain is desired (e.g. for therapeutic applications), the BBB prevents 98% of small-molecules and an even greater percentage of large molecules from