

ABSTRACT

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Recent advances in drug delivery and targeting to the brain.

Sethi B(1), Kumar V(1), Mahato K(2), Coulter DW(3), Mahato RI(4).

Author information:

(1)Department of Pharmaceutical Sciences, University of Nebraska Medical Center, Omaha NE 68198, USA.

(2)College of Medicine, University of Nebraska Medical Center, Omaha NE 68198, USA.

(3)Department of Pediatrics, University of Nebraska Medical Center, Omaha, NE 68198, USA.

(4)Department of Pharmaceutical Sciences, University of Nebraska Medical Center, Omaha NE 68198, USA. Electronic address: ram.mahato@unmc.edu.

Our body keeps separating the toxic chemicals in the blood from the brain. A significant number of drugs do not enter the central nervous system (CNS) due to the blood-brain barrier (BBB). Certain diseases, such as tumor growth and stroke, are known to increase the permeability of the BBB. However, the heterogeneity of this permeation makes it difficult and unpredictable to transport drugs to the brain. In recent years, research has been directed toward increasing drug penetration inside the brain, and nanomedicine has emerged as a promising approach. Active targeting requires one or more specific ligands on the surface of nanoparticles (NPs), which brain endothelial cells (ECs) recognize, allowing controlled drug delivery compared to conventional targeting strategies. This review highlights the mechanistic insights about different cell types contributing to the development and maintenance of the BBB and summarizes the recent advancement in brain-specific NPs for different pathological conditions. Furthermore, fundamental properties of brain-targeted NPs will be discussed, and the standard lesion features classified by neurological pathology are summarized.

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