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POLYMERIC NANOPARTICLES IN THE TREATMENT OF CENTRAL NERVOUS SYSTEM DISEASES

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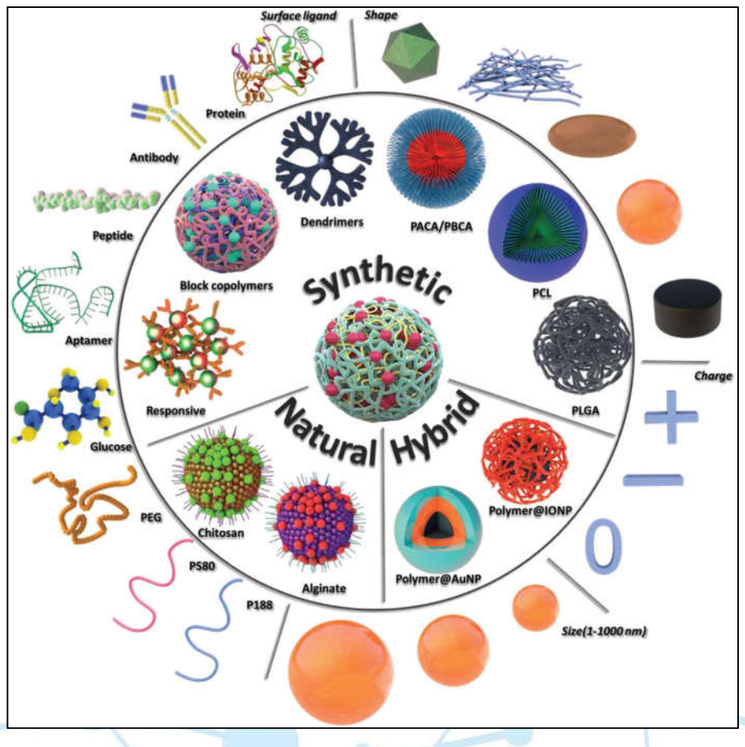
Introduction. The main impediment to the absorption of drugs in the CNS is the blood-brain barrier (BBB). A promising platform in the successful realization of a treatment, are the pilimeric nanoparticles (PNP).

Keywords. central nervous system, blood-brain barrier, polymeric nanoparticles.

Purpose. Description of PNP as nanosystems capable of transporting drug molecules through BBB at the level of SNC.

Material and methods. The main sources of information regarding the structure, methods of obtaining, functionalization, and mechanisms involved in transporting PNP through BBB to therapeutic target.

Results. BBB is a mechanical barrier between blood flow and brain tissue, with a very high selective capacity and allows only the entry of water, nutrients and neurotransmitters that govern the maintenance of CNS homeostasis, but limits the entry of toxins and pathogens to prevent potential neuronal damage. This unique and restrictive barrier rejects the entry of 98% of small drug molecules and ~ 100% of large molecules. The ability of drugs to cross BBB depends on: the size of the drug molecule, hydrophilicity, lipid solubility (fig.1), transport pathway (fig. 2) and degree of ionization. PNPs are a promising choice as a target delivery platform for CNS drugs due to their adjustable architecture (10 to 1000 nm), nontoxicity, biocompatibility and controllable drug release. These PNPs can be easily modified with specific ligands targeting endothelial cell receptors, resulting in improved transcytosis efficiency. In addition, PNPs have an increased circulation time and are biodegradable. After absorption and internalization of the cell, the polymeric matrix can be triggered to release the drug, resulting in a protected, prolonged and targeted therapeutic effect. PNPs are versatile to be able to incorporate a wide range of drugs.



Conclusion. Thus, PNPs are a promising nanosystem in the BBB crossing for an effective treatment of SNC diseases.

Figura 1. Polymeric nanoparticles developed for BBB penetration and their tunable parameters: surface (charge), size, and shape W. Zhang et al., Adv. Sci. 2021, 8, 2003937. DOI: 10.1002/advs.202003937

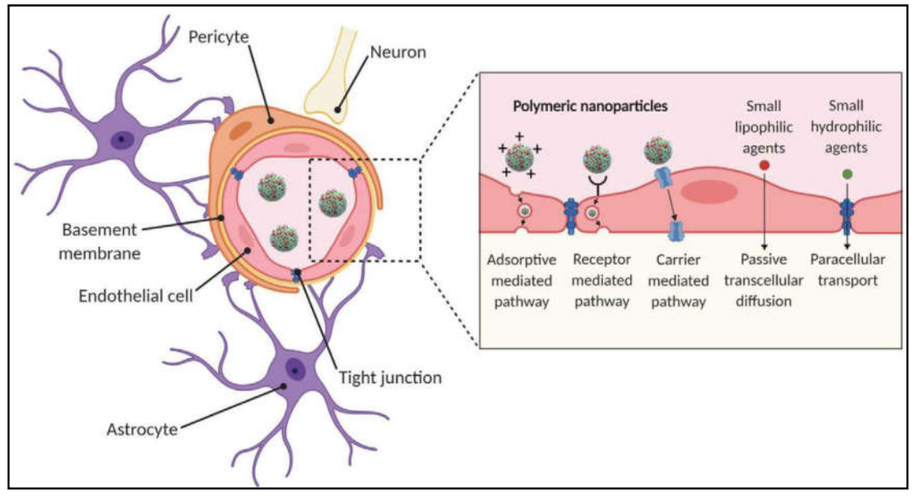


Figura 2. Polymeric nanoparticles are transported across the endothelium carrier via carrier-mediated, receptor-mediated, and adsorptive-mediated pathways. W. Zhang et al., *Adv. Sci.* **2021**, *8*, 2003937. **DOI: 10.1002/advs.202003937**